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COLLAGEN AND ELASTIN IN CONNECTIVE TISSUE

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INTRODUCTION

Pathology

It has long been realized that during the process of aging, the fibrous components of skin undergo certain changes. Unna, in his classical studies of senile skin, believed that there was some chemical alteration in the elastic fibers and named the modified structures "elacin" to distinguish them from the "elastin" of normal tissue. Unna (42) demonstrated that much elacin was present in senile elastosis while the collagen fibrils were much reduced in amount. This worker was fully aware that the collagen fibrils in senile elastosis undergo profound changes and those fibrils which had the physical appearance of collagen but the staining properties of elastica, he named collastin. On the other hand, those collagen fibrils which showed the staining reactions of elacin were referred to as collacin.

Over the past fifty years pathologists have confirmed these findings wherein the amount of elastic-staining material in senile elastosis increases remarkably, apparently at the expense of the collagen fibrils. Considerable confusion has arisen from the general application of Unna's views on senile elastosis to other conditions. Similar changes have also been observed in many conditions both of senile and pathologic skin, particularly where edema, degeneration, or atrophy are present, although whether these changes bear any relationship to the phenomena of aging is by no means certain.

Strobel (39), in a histologic study of skin of all age groups, found that the principal change was in the collagen fibrils. He is of the opinion that the elastic fibers do not show any degenerative changes with age, but merely physical extension and alignment due to overstretching. Hill and Montgomery (26) on the other hand found only slight changes in either the collagen or the elastic fibers of skin over an age group from birth to 78 years. Ejiri (14), after a wide and detailed study of skin of all ages, concluded that senile changes occur mainly in the elastic fibers and not in those of collagen. The collagen fibers seem to decrease in number, being replaced by much elastic-staining material. Dick (13), Ma and Cowdry (32), and Tattersall and Seville (40) have all confirmed this observation.

The fundamental changes in the fibrous components of skin during aging, however, are still a matter of conjecture. Some workers consider that the large amount of elastic staining material present in exposed areas of skin in senile patients is indeed true elastin which has been elaborated in the manner whereby elastin is normally produced. At the same time, they recognize that the increase in elastic-staining material is almost always accompanied by a decrease in the number of collagen fibrils. Lansing (31), for instance, regards the elastic-staining material in senile elastosis as genuine elastin on the grounds that in morphology and staining properties it closely resembles elastin and, moreover, is digested by the enzyme elastase. The confusion that exists is also shown by his introduction of the phrase "a bizarre type of elastic tissue" to describe this material (31). Other workers, however, consider that the elastic-staining material is produced by the modification of the collagen fibrils present,

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(15, 41) so providing a rational explanation for the disappearance of such fibrils and for the collastin and collacin described by Unna.

Recent electron microscope studies have further emphasized the difficulties (41). In Ehlers-Danlos syndrome, for example, the elastic-staining material is morphologically very similar to aortic elastin. In senile elastosis, on the other hand, the elastic-staining material is composed mainly of collagen fibrils in various stages of modification and much amorphous material, (fig. 4) while in pseudoxanthoma elasticum, which is also characterized by variable elastic staining, the fibers consist of collagen which seems quite intact and is indistinguishable under the electron microscope from that of normal dermis.

Morphogenesis of Elastic Tissue

From the morphogenetic aspect the indications are also vague, since the stages whereby elastic fibers are elaborated in the organism have not as yet been clearly defined. In the first place, there is doubt as to whether or not elastoblastic cells, specialized in function to produce elastic fibers only, really exist. While claims for the existence of such cells have been put forward at various times, counter claims suggest that elastic fibers are derived from the fibroblasts which elaborate the collagen fibrils (20). Again, there is general agreement that elastic fibers and collagen always develop in association, the former structures never being found in sites which are devoid of collagen. "Indeed it would appear that collagen is a prerequisite for its formation" (35). A further significant point is that while both these fibrous structures are being elaborated during periods of rapid synthesis, as in fetal and regenerating tissue, the elastic fibers tend to appear somewhat later than those of collagen. Moreover, elastogenesis is usually associated with the presence of large amounts of metachromatic staining material (35).

X-ray Diffraction Studies

On the basis of X-ray diffraction data, Astbury (3) has classified the fibrous proteins into two broad groups, the keratin-myosin-epidermin-fibrinogen (k-m-e-f) group and the collagen group. The members of the k-m-e-f group, in addition to having common structural features which yield very similar and characteristic diffraction patterns, all manifest long-range elasticity. The members of the collagen group, in spite of their diverse origins, also show a characteristic diffraction pattern, which, however, is quite different from that of the k-m-e-f group. The members of the collagen group are also distinguished in that normally they do not have any long-range elastic properties, and Astbury (2) considers that they are built from polypeptide chains in a stereochemically extended configuration.

This structural plan is substantiated by the fact that following thermal treatment, collagenous fibers may be induced to contract to a state in which they manifest the long-range elasticity typical of the k-m-e-f group. Where does elastin, defined as the protein found in elastic tissue, fit into this scheme of classification? Is such a highly elastic protein better fitted into the k-m-e-f group, whose members all show elasticity, or does it indeed belong to the collagen group which normally does not possess this property? Ordinarily, the X-ray diffraction pattern of elastin preparations from ox ligamentum nuchae is not of the oriented collagen type, rather it is "amorphous" or "diffuse." The typical collagen pattern, is, however, developed on stretching the material, although whether this is due to collagen fibrils, which are extremely difficult to remove completely from the elastic fiber, is still undecided. Astbury assumed that extraneous collagen fibrils were not responsible for the pattern developed on stretching and concluded that elastin is a member of the collagen group. Moreover, in order to account for its elastic properties, Astbury suggested that elastin was a collagen-type protein but with a thermal transition point below ordinary temperatures. "Its polypeptide chains are normally in a folded state corresponding to that assumed by the other collagen fibers when they contract at higher temperatures." Bear (10), however, is of the opinion that the collagen pattern is due to a trace of extraneous collagen included as an impurity in the elastin sample and says "it seems clear that elastin must be excluded from the col-

lagen family." Thus at the present time it is difficult to classify elastin with the other fibrous proteins.

Electron Microscope Studies of Elastic Tissue

Various workers (16, 17, 18, 24, 37, 38, 43, 44) have made electron microscope studies of elastic tissue, but here again it has proved difficult to draw conclusions. Elastic fibers are ill-defined structures and many morphologic types have been found which point to the complex and variable nature of elastic tissue. Most workers agree that this tissue is composed of broad, ill-defined fibers, (showing no regular structural features) which are usually associated with sheets and fragments of various sizes and shapes. Moreover, in all forms of elastic tissue, much amorphous and dense material is found, together with networks of well-defined collagen fibrils.

Studies of the reaction with the enzyme elastase (24, 30) indicate that the broad, ill-defined fibers are built from fine, non-striated fibrils held together by a dense cement substance. Schwarz and Dettmer, (36), however, consider that they are built from striated fibrils, very similar to collagen in appearance. These authors seem to have taken no adequate steps to ensure that all extraneous collagen fibrils were removed from the sample prior to enzyme treatment and electron microscope examination, and there is still no definite evidence that the striated fibrils do in fact originate from within the broad, ill-defined fibers.

From the variety of morphologic data on elastic tissue, it is difficult to decide what elastin, the entity assumed to be common to all forms of the tissue, really is. If one disregards the large amount of debris material and collagen fibrils which are invariably present, it would seem that elastin is represented by the broad, ill-defined fibers. If this is indeed the case, it must be accepted that the elastin is dual in nature, consisting of fibrils in close association with a dense, non-fibrous component (23). Whatever the correct explanation, the electron microscope studies bring out very clearly the complex nature of elastic tissue and the fact that elastin, whatever its true nature, is intimately associated with fibrils of collagen.

Chemical Studies of Elastic Tissue

Chemical characterization of elastic tissue is equally difficult, in view of the variations which have been observed.

Little work has been done on the chemical composition of dermal elastin, but it is significant that the reported calcium content (11, 33) is in conformity with the observations of Lansing and associates (29) in aortic elastin. It is permissible to consider Lansing's (29) observations on the amino acid composition of young and old elastins and Hall's (21) observations on the complexity of aortic elastin as being applicable to elastin from a number of sites.

Hall (21, 22) showed that human aortic elastic tissue differed from ox ligament in that the treatment with boiling 1 per cent acetic acid, which was adequate for the removal of all extraneous collagen from the latter tissue, left a residue in the case of aorta which still contained a high proportion of amino acids which were indicative of the presence of a collagen-like component. The resistance of this material to solution was not absolute, however, nor was that of elastin, since both could be taken into solution in boiling 40 per cent urea solution if the liquor/tissue ratio and the time of treatment were adequate. There was, moreover, a progressive difference in solubility as one passed from collagen through the component intermediate in amino acid composition to "true" elastin. Lansing reported that the very amino acids which formed the basis of the analytic differentiation between collagen, the intermediate component, and elastin increased in amount in his elastin preparations with the age of the subject.

Thus in spite of many different approaches, our knowledge of elastin and elastic tissue is most unsatisfactory. All investigators agree on one point, namely the indication that collagen fibrils are always closely associated with elastic tissue. It is this intimate inclusion of such fibrils that leads to the uncertainty as to whether or not they are extraneous to the structure of the elastic tissue fiber. Indeed, Banga (9) on the basis of the observation of Schwarz and Dettmer (36) has suggested that collagen fibrils constitute the core of each elastin fiber. In the face of

such confusion investigators have continued to regard collagen and elastin as two distinct proteins, with their own intrinsic staining properties, chemical composition, mode of elaboration, etc., and have ignored the possibility of an intimate relationship between these two substances. In our opinion the key to a better understanding of the degenerative changes manifested by connective tissue lies in this very relationship.

THE RELATIONSHIP BETWEEN COLLAGEN AND ELASTIN

New evidence bearing on this relationship has been recently obtained (12). Fresh dermis as well as collagen substantially free from ground substance prepared (27) by a modification of Neuman's procedure (34) treated at 37 C. and for various periods of time, with alkaline buffer solutions (pH range 7-10.4), pancreatic enzymes, and with sodium metaperiodate solutions at pH 5.0, have been shown to undergo transformation. Under the light-microscope, lamellar structures (25) were observed in both the control and the treated material (figs. 1-3) but were more numerous and exhibited a wider variety of elastic staining properties only in the latter. Figures 2 and 3 show two directly comparable photographs of the treated skin taken in ordinary and polarized light. Masses of amorphous material, which stain deeply, can be seen and are associated with the lamellae, which are highly anisotropic. Other lamellae in the treated material stained pale blue or pink and were anisotropic, while others stained like elastin and were not anisotropic. Further structures, histologically indistinguishable from elastin in the form of wavy black-staining fibrils, were observed.

The electron microscope studies also confirmed the presence of elastin-like structures, (figs. 5-8) which seem to be formed by the modification of collagen fibrils to varying degrees; the amorphous material produced in this process seems to form the elastin-like structures by deposition on the various fiber structures present. Chemically also, this modification of collagen fibrils involves the release of fragments rich in hydroxyproline and arginine, in keeping with what is known of the relative amino acid composition of collagen and elastin. Carbohydrate-protein links also seem to be involved in the modification of the collagen fibrils, since material rich in reducing sugars is also released.

At the present stage there is insufficient evidence to determine the part played by polysaccharides in the transformation of collagen. It may be significant, however, that the release of protein material rich in hydroxyproline is always associated with the simultaneous release of material containing large amounts of reducing sugar. Furthermore, the reagents which bring about the transformation are precisely those which would be expected to affect the polysaccharide component of the collagen fibrils, viz., alkaline buffer solutions and periodate solutions.

The possibility that collagen fibrils actually form an integral part of certain natural elastic structures has already been considered. Banga (9) and Schwarz and Dettmer (36) have adduced evidence which supports this view. In addition some preliminary observations by the present authors are relevant. Elastin (ox ligamentum nuchae) was freed from "extraneous" collagen (as assessed by electron microscope examination) by treatment with acetic acid. Electron microscope studies of the reaction between this substrate and the enzyme collagenase revealed the presence of collagen-like fibrils which, as would be expected if they were indeed genuine collagen, were ultimately completely digested.

Morphologic differences in animal and human collagen from different age-groups have been recorded. Using the electron microscope the width of the collagen fibrils in rat and human skin, (8, 18) human Achilles tendon (43) and human sclera (37, 38) has been found to increase with age. The smaller, finer fibrils found in the dermis of babies are separated by a larger amount of amorphous material (presumed ground substance) than the thicker, more closely-packed adult fibers (17). This increase in ground substance in young tissue is confirmed by the amorphous X-ray pattern (19).

There is a growing body of evidence which indicates that the reactivity of collagen is also a function of age. Banfield (7) has found that the solubility of human skin col-

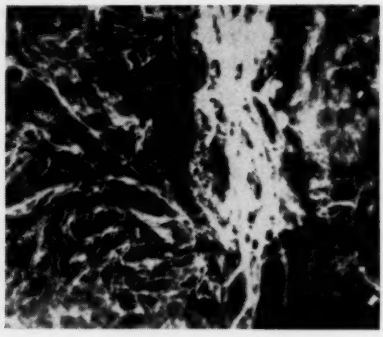


Fig. 1.

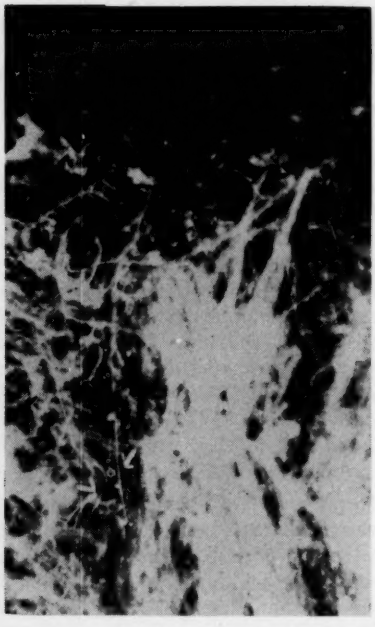


Fig. 2.

Fig. 3.

FIGS. 1-3, show a frozen section (V.S.) of the dissected dermis treated with alkaline buffer under pressure (ref. 11). Fixed in phosphate buffered formol-saline, at a pH 7.3 and stained with Hart's modification of the Weigert stain.

FIG. 1. Low power view of treated section. The left hand area shows original fibers staining blue, whereas the newly formed elastin-like material on the right stains brown. Control sections showed only the blue fibers. X50.

FIG. 2. shows the brown-black amorphous material associated with nonstaining transparent lamellae, which seem to be coated by this in many regions. Narrow fibrils, which stain black (indicated by arrows), seem to have been newly formed. X92.

FIG. 3. The same section as fig. 2, photographed in polarized light under comparable conditions. The lamellae (indicated by white arrow) are highly oriented in regions where they are not coated by the amorphous material. X92.

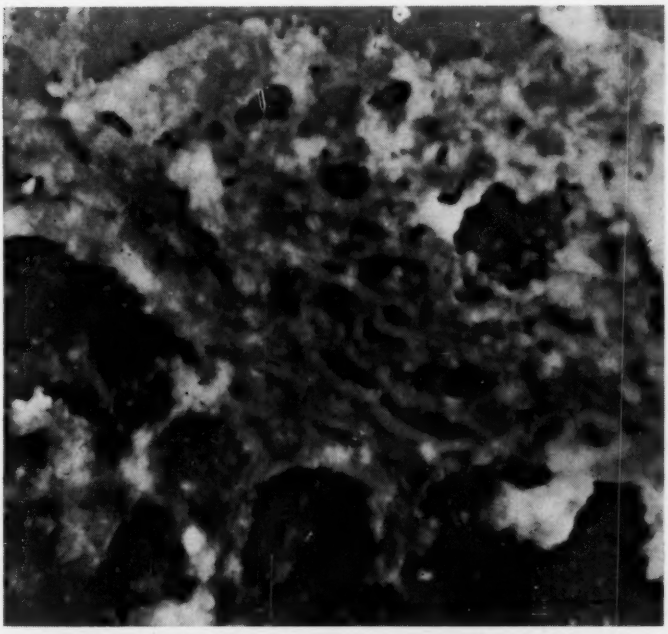


Fig. 4.

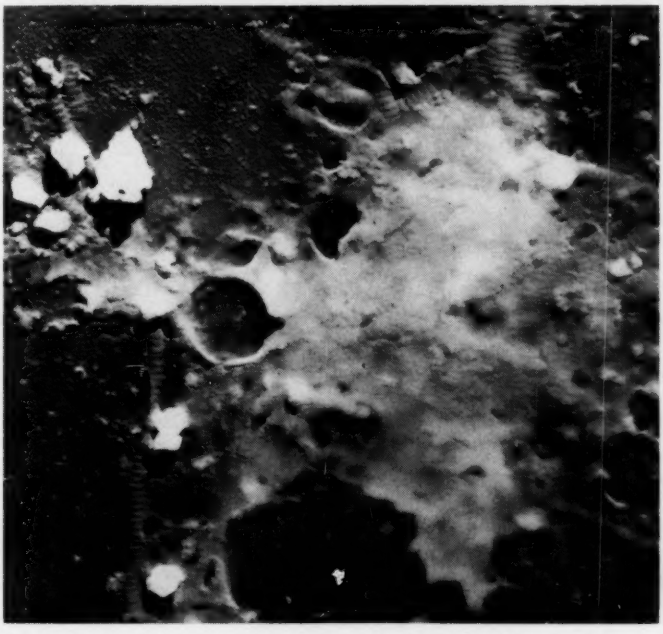


Fig. 5.

FIG. 4. Fresh whole dermis from exposed forearm skin from an adult aged 69 years suffering from senile elastosis, showing fiber network and amorphous material.

FIG. 5. Fresh whole dermis from the abdomen of a 7 year old child incubated with borate buffer (pH 8.8) for 22 hours at 37 C. The degenerate collagen is admixed and coated with dense amorphous material to form elastin-like sheets, similar to those found in pathologic skin (see fig. 4).

Fig. 6.

Fig. 7.

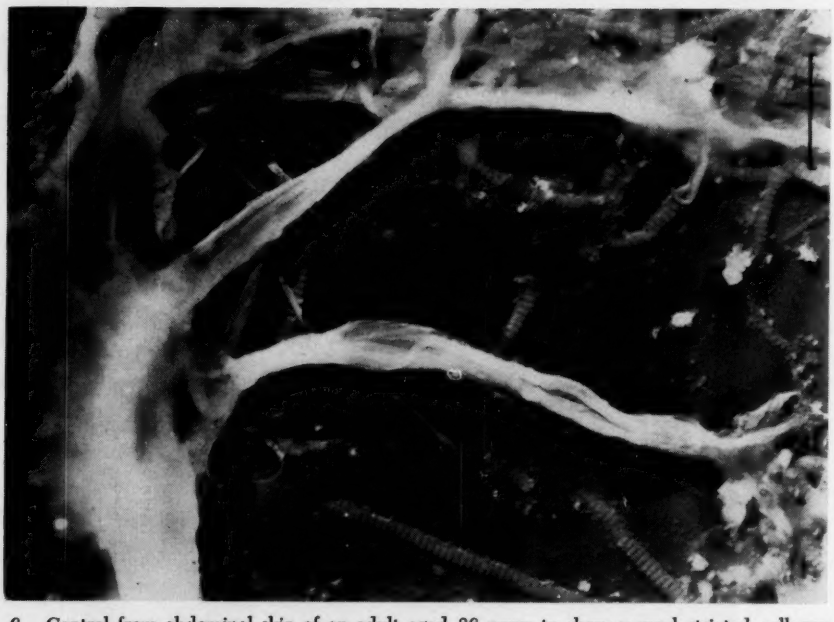


FIG. 6. Control from abdominal skin of an adult aged 36 years to show normal striated collagen fibrils and filamenting-type elastin.

FIG. 7. Prepared abdominal skin collagen from a 9 year old child incubated with 1 per cent sodium metaperiodate in buffer pH 5.0 for one and a half hours at 37 C. Example of typical skin-type elastin fiber (with component filaments) that was found in increased numbers following this treatment.

FIG. 8. Prepared abdominal skin collagen from an adult aged 36 years incubated with borate buffer (pH 8.8) for 20 hours at 37 C. Elastin-like sheets intimately mixed with striated collagen fibers (arrows) and elastin fibers.

lagen in 0.01 per cent acetic acid solution, although marked below the age of one year, is only moderate up to 30 years and very low above this age. In the case of human tendon collagen, the solubility below the age of one year is also appreciable, but above this age the collagen is completely resistant to the acid.

The effect of collagenase on human skin collagen also becomes less marked with age. Keech (27) has shown that it is possible to obtain from prepared collagen fibrils from infants nearly twice as much soluble nitrogen in the reaction mixture as from adults over the age of 30 years, and from children aged from 1 to 10 years, one and a half times as much. Samples from the same preparations of collagen, when modified by alkaline treatment to produce elastin-like structures, also show similar gradation in protein extraction figures (12), i.e., the apparent transformation, both morphologic and biochemical, of skin collagen into "elastin" by alkaline treatment is much more marked in the child. Similar results have also been obtained using fresh whole dermis. Not only do these observations point to a similarity in the action of alkali and the enzyme collagenase (28), but also they may open the way to classifying the various pathologic states of collagen on the basis of their reaction with collagenase or with alkali, i.e., the ease with which they can be transformed into elastin-like structures.

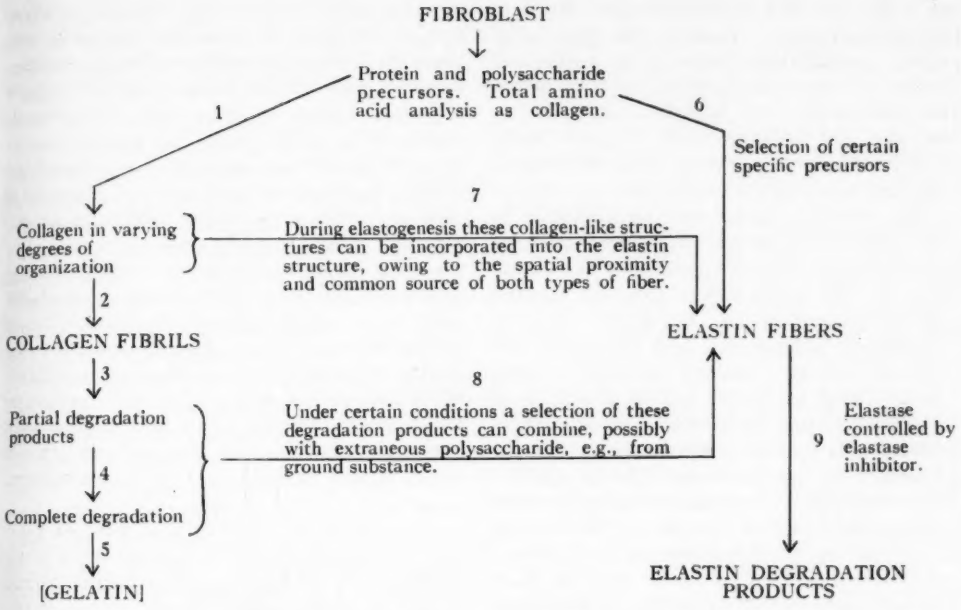
DISCUSSION

The observations mentioned above, indicating the possible *in vitro* conversion of collagen into elastin, form a useful basis for discussing connective tissue changes which occur *in vivo*.

The possibility of this transformation permits the resolution of many of the difficulties previously mentioned. The most fundamental of these and one which has considerable bearing on the morphogenetic approach to connective tissue has been the lack of positive evidence for the existence of an elastoblast. There is no longer any need to postulate the existence of such a cell, if the fibroblast which elaborates collagen fibrils can produce the necessary components for the synthesis of elastin. The chemical differences between collagen and elastin, and the fact that an *in vitro* synthesis of the latter is possible from the partial degradation products of the former indicate that collagen must be built up of a group of dissimilar fragments, such as polypeptides and polysaccharides. If it is assumed that during the biosynthesis of collagen by the fibroblasts such a heterogenous group of components is produced, then collagen and elastin can be synthesized by combination of differing selections of these fragments. This, however, is only one possibility. Since it is known that *in vitro* degradation of collagen can provide adequate material for the synthesis of "elastin," there is every likelihood that *in vivo* degradation, by whatever means it may be effected will afford the same spectrum of small components from which elastin can be synthesized by appropriate selection.

The first of these two hypothetical pathways, being essentially a synthetic one, would seem to be the more likely for the normal production of elastin. However, the second one, which would seem to be biologically less probable because it necessitates the breakdown of highly organized collagen fibrils for the production of another organized structural unit, "elastin," is more in accord with many of the observed facts regarding senile and degenerate tissue. Since the same type of structural unit would be used for the production of "elastin" either direct from the products of fibroblastic activity or from degraded collagen, the morphologic appearance, staining behavior and chemical composition should be similar. Because of this, previous difficulties in interpreting the elastic-staining material in senile elastosis as elastin, a bizarre form of elastin or as modified collagen, are removed. In addition a rational explanation is given for elacin, collastin, and collacin, the "intermediate" states postulated by Unna as occurring in senile elastosis and other degenerative conditions.

The diagram on page 397 indicates the two possible pathways for elastogenesis. One hypothesis requires the simultaneous production of collagen by stages 1 and 2 and elastin by stage 6. This independent elaboration would involve the selection of different groupings of polypeptide and polysaccharide fragments. The interaction of these two proc-


FIBROBLAST
Protein and polysaccharide precursors. Total amino acid analysis as collagen.
1
6
Selection of certain specific precursors
7
Collagen in varying degrees of organization
During elastogenesis these collagen-like structures can be incorporated into the elastin structure, owing to the spatial proximity and common source of both types of fiber.
2
COLLAGEN FIBRILS
ELASTIN FIBERS
3
8
Partial degradation products
Under certain conditions a selection of these degradation products can combine, possibly with extraneous polysaccharide, e.g., from ground substance.
9
Elastase controlled by elastase inhibitor.
4
Complete degradation
5
[GELATIN]
ELASTIN DEGRADATION PRODUCTS

esses is, however, not excluded and incorporation of some of the partially synthesized collagen fibrils into the structure of elastin may occur (stage 7). This could account for the difficulties in obtaining a sample of elastic tissue entirely free of collagen.

The other possible pathway necessitates the preformation of collagen fibrils by stages 1 and 2, and their subsequent degradation by stages 3 and 4, before elastin can be synthesized from a selection of the degradation products thus obtained (stage 8).

Either of these hypotheses would account for the variable composition of "elastins" of different age groups (29) and for the existence of a component in aortic "elastin," which is intermediate in amino acid composition and solubility between collagen and elastin (21). They could also explain the observations of Schwarz and Dettmer (36) on the release of collagen-like structures from elastic tissue by the action of elastase, and the similar result obtained by the present authors, on treating "elastin" with bacterial collagenase (12).

The problem of classifying elastin into one of the two groups of fibrous proteins on the basis of its x-ray diffraction pattern is also rendered easier. Since it is composed either directly or indirectly of the products of fibroblastic activity as in collagen, it should take its place in the same group, as Astbury originally suggested (3). The inclusion of some collagen fibrils in the elastic tissue fiber would explain the weak collagen pattern against a diffuse background, which has sometimes been observed. These fibrils would align themselves on stretching to give rise to a strong and more oriented collagen pattern.

The hypotheses also provide a rational explanation of the variety of morphologic forms of elastic tissue found in the electron microscope studies and the intimate association of collagen fibrils with this material.

As the age of the subject advances the amount of elastic staining material in the tissues increases, while the reactivity of the collagen toward chemical attack (12) and enzymatic destruction (27) decreases. The majority of the collagen fibrils in adult tissue will, however, have passed through the stage 2 and will be fully mature and hence will not be available for inclusion in elastic fibers (stage 7). The variable chemical composition of senile "elastin" (31) indicates that such incorporation does occur, and if there

are a few partially formed collagen fibrils to take part in such a co-synthesis, they must arise by partial degradation of the preformed fibrils. It seems likely, therefore, that while both pathways may be operative, the one involving the breakdown of collagen fibrils is of greater importance in senile conditions.

Recent work has indicated the importance of the enzyme elastase and its inhibitors in the controlled synthesis and degradation of elastic tissue. In arteriosclerosis, the elastic fibers of the aortic media undergo marked changes, especially in organization and in staining properties. Balo and Banga (4) isolated an enzyme, elastase, capable of completely digesting elastin and on the basis of its properties, ascribed the changes in arteriosclerosis to its action. Furthermore, the discovery by the same authors (6) that a circulating inhibitor in normal serum was either completely absent or present in low concentration in arteriosclerosis, seemed to present conclusive evidence in favor of this view. However, a comparison of the elastase content of pancreas from subjects with and without a history of arteriosclerosis (5) showed that there was an actual decrease in the case of arteriosclerotics, notwithstanding the fact that the level of the inhibitor in the serum was extremely small. These findings seemed to point to the involvement of elastase in the synthesis, rather than the degeneration of elastin, and hence it was impossible to account for the observed changes in medial elastin solely in terms of the action of elastase controlled by an inhibitor. Balo and Banga (5) now consider that the changes are due to a failure to replace elastin destroyed in other ways.

The present suggestions regarding the formation of elastin have considerable bearing on this concept. There is, however, no direct evidence that elastase is involved in the transformation of collagen into elastin *in vitro*. There are difficulties in assessing the effect of the enzyme near its optimum pH range, 8.7 - 9.2, since within this range the buffer solution itself is capable of producing elastin-like structures, which the enzyme presumably simultaneously destroys. It has been shown, however, that at lower pH values nearer neutrality, certain enzyme preparations from the pancreas are capable of producing elastin-like structures from collagen *in vitro*. Thus it seems likely that there are present in the pancreas enzymes capable of bringing about both the synthesis and breakdown of "elastin."

The pancreatic fractions which have been shown to have this power are those containing both trypsin and chymotrypsin. The bulk of the evidence is in favor of reaction 3 and/or 4 being concerned with either the removal or alteration of the polysaccharide fragment of the collagen (12). Therefore it does not seem likely that the effects observed using these pancreatic fractions can be ascribed to their proteolytic activity. The elastin content of any tissue may, however, be controlled by the presence of other enzyme systems. If the factors influencing stage 3 or 4 are deficient, even though only a small concentration of elastase is secreted by the pancreas (or permitted to be effective on account of a high level of circulating inhibitor), the elastin structures would tend to be destroyed or at least affected. This course of events could account for the changes observed in arteriosclerosis.

If on the other hand elastase and the factors influencing stages 1 to 4 are present in normal concentration, while the amount of inhibitor is considerably increased, elastin will be produced at a rate greater than it can be destroyed and true elastosis will ensue. Hall and Saxl (25) have demonstrated that in the serum of one case of Ehlers-Danlos syndrome examined, the concentration of inhibitor was between 50 and 100 times as great as that in pooled normal serum. The elastosis in this syndrome is well authenticated by histologic studies while Tunbridge and associates (41) have shown that the elastic staining material in this tissue is morphologically similar to aortic elastin.

In senile elastosis, the necessary assumption is that the factors governing stages 1, 2, and 3 are active, but the factors or enzymes governing stage 4 and 7 are not operative. Thus although collagen is modified, the reaction does not go to completion with either the full destruction of collagen or the full production of elastin but stops at some intermediate stage, characterized by partially degraded collagen fibrils and elastin-staining amorphous material.

It has been mentioned that alkaline conditions seem to be most effective in bringing about the *in vitro* modification of the collagen fibrils and it may be significant that in many degenerative states of connective tissue, a general increase in tissue alkalinity has been reported (for full references see ref. 1). It is too early to assess the importance of ground substance in the degenerative process. Preliminary experiments (12) revealed a greater transformation of collagen to "elastin" in whole fresh dermis than from prepared material which was substantially free from ground substance. While the hypotheses advanced here imply that the first stage in degeneration involves only the collagen fibrils themselves, it does not necessarily rule out the participation of ground substance as the reaction proceeds.

SUMMARY

The *in vitro* synthesis of elastin-like material from collagen is used as a basis for the elaboration of two hypothetical schemes for the *in vivo* synthesis of "elastin." Both postulate the fundamental fact that elastin and collagen originally derive from the same connective tissue cell. The two hypotheses differ in that one supports the direct synthesis of elastin from the products of fibroblastic activity, whereas the other requires the prior formation and subsequent degradation of collagen fibrils and the synthesis of elastin from a selection of the fragments.

Some elastin may be synthesized according to the former hypothesis, while the increase in elastic staining material observed in senile and degenerative conditions can be more fully explained by the latter. The conditions under which this modification of the collagen fibrils can be made to occur indicate the possible removal of polysaccharide. On the basis of these hypotheses rational explanations of the histologic, electronmicroscope, x-ray, and biochemical findings on normal connective tissue can be made, and the specific features of arteriosclerotic tissue, senile elastosis skin, and Ehlers-Danlos skin can be explained.

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REFERENCES

1. Altshuler, C. H., and Angevine, D. M.: Histochemical Studies on the Pathogenesis of Fibrinoid. *Am. J. Path., 25:* 1061-1078, 1949.
2. Astbury, W. T., and Woods, H. J.: X-ray Studies of Hair, Wool and Related Fibres. II. The Molecular Structure and Elastic Properties of Hair Keratin. *Phil. Tr. Roy Soc. A, 232:* 333-394, 1933.
3. Astbury, W. T., and Bell, F. O.: X-ray Data on the Structure of Natural Fibres and Other Bodies of High Molecular Weight. *Tabulae biol., 17:* 90-112, 1939.
4. Balo, J., and Banga, I.: The Elastolytic Activity of Pancreatic Extracts. *Biochem. J., 46:* 384-387, 1950.
5. Balo, J., and Banga, I.: Change in the Elastase Content of the Human Pancreas in Relation to Arteriosclerosis. *Acta Physiol., 4:* 187-194, 1953.
6. Balo, J., and Banga, I.: Elastase and Elastase Inhibitor. *Nature, 164:* 491, 1949.
7. Banfield, W. G.: The Solubility and Swelling of Collagen in Dilute Acid with Age Variations in Man. *Anat. Rec., 114:* 157-172, 1952.
8. Banfield, W. G.: Width and Length of Collagen Fibrils during the Development of Human Skin, in Granulation Tissue and in the Skin of Adult Animals. *J. Gerontol., 10:* 13-17, 1955.
9. Banga, I.: Thermal Contraction of Collagen and Its Dissolution with Elastase. *Nature, 172:* 1099-1101, 1953.
10. Bear, R. S.: *Advances in Protein Chemistry, 7:* Academic Press, New York, 1952, page 89.
11. Brown, H.: The Mineral Content of Human Skin. *J. Biol. Chem., 75:* 789-794, 1927.
12. Burton, D., Hall, D. A., Keech, M. K., Reed, R., Saxl, H., Tunbridge, R. E., and Wood, M. J.: The Apparent Transformation of Collagen Fibrils into "Elastin." *Nature,* 1955, (in press).
13. Dick, J. C.: Observations on the Elastic Tissue of the Skin with a Note on the Reticular Layer at the Junction of the Dermis and Epidermis. *J. Anat., 81:* 201-211, 1947.
14. Ejiri, I.: Studien über die Histologie de menschlichen Haut. III Mitteilung: Über die regionären und Altersunterschiede der verschiedenen Hautelemente mit besonderer Berücksichtigung der Altersveränderung der elastichen Fasern. *Jap. J. Dermat. & Urol., 41:* 8-12, 1937.
15. Gillman, T., Penn, J., Bronks, D., and Roux, M.: Staining Reactions of Elastic Fibres with Special References to "Elastotic Degenerations" in the Human Skin. *Nature, 174:* 789-791, 1954.
16. Gross, J.: Structure of Elastic Tissue as Studied with the Electron Microscope. *J. Exper. Med., 89:* 699-708, 1949.

17. Gross, J.: A Study of Certain Connective Tissue Constituents with the Electron Microscope. *Ann. New York Acad. Sc., 52:* 964-970, 1950.

18. Gross, J.: A Study of the Ageing of Collagenous Connective Tissue of Rat Skin with the Electron Microscope (Abstract). *Am. J. Path., 26:* 708, 1950.

19. Gross, J.: Connective Tissue Fine Structure and Some Methods for Its Analysis. *J. Gerontol., 5:* 343-360, 1950.

20. Haas, G. M.: Elastic Tissue. *Arch. Path., 27:* 334-365, 583-613, 1939.

21. Hall, D. A.: Elastin from Human Tissue and from Ox Ligament. *Nature, 168:* 513-514, 1951.

22. Hall, D. A.: The Reaction Between Elastase and Elastic Tissue. 1. The Substrate. *Biochem. J., 59:* 459-465, 1955.

23. Hall, D. A., Reed, R., and Tunbridge, R. E.: Structure of Elastic Tissue. *Nature, 170:* 264-272, 1952.

24. Hall, D. A., Reed, R., and Tunbridge, R. E.: Electron Microscope Studies of Elastic Tissue. *Exper. Cell Res., 8:* 35-48, 1955.

25. Hall, D. A., and Saxl, H.: Unpublished data.

26. Hill, R., and Montgomery, H.: Regional Changes and Changes Caused by Age in the Normal Skin. *J. Invest. Dermat., 3:* 231-245, 1940.

27. Keech, M. K.: The Effect of Collagenase on Human Skin Collagen, Comparison of Different Age-Groups and of Cases With and Without "Collagen Disease." *Yale J. Biol. & Med., 26:* 295-306, 1954.

28. Keech, M. K.: Human Skin Collagen from Different Age-Groups Before and After Collagenase Digestion. An Electron Microscope Study. *Ann. Rheumat. Dis., 14:* 19-50, 1955.

29. Lansing, A. I., Roberts, E., Ramasarma, G. B., Rosenthal, T. B., and Alex, M.: Changes with Age in Amino Acid Composition of Arterial Elastin. *Proc. Soc. Exper. Biol., 76:* 714-717, 1951.

30. Lansing, A. I., Rosenthal, T. B., Alex, M., and Dempsey, E. W.: The Structure and Chemical Characterization of Elastic Fibers as Revealed by Elastase and Electron Microscopy. *Anat. Rec., 114:* 555-577, 1952.

31. Lansing, A. I.: Ageing of Elastic Tissue and the Systemic Effects of Elastase. *Ciba Foundation Colloquia on Ageing, 1:* 88-108, J. & A. Churchill, London, 1955.

32. Ma, C. K., and Cowdry, E. V.: Aging of Elastic Tissue in Human Skin. *J. Gerontol., 5:* 203-210, 1950.

33. MacCardle, R. C., Engman, M. F., Jr., and Engman, M. F., Sr.: Spectrographic Analysis of Neurodermatitic Lesions. *Arch. Dermat. & Syph., 44:* 429-440, 1941.

34. Neuman, R. E.: The Amino Acid Composition of Gelatins, Collagens, and Elastins from Different Sources. *Arch. Biochem., 24:* 289-298, 1949.

35. Robb-Smith, A. H. T.: Normal Morphology and Morphogenesis of Connective Tissue, In: *Connective Tissue in Health and Disease.* Ed., G. Asboe-Hansen, E. Munksgaard, Copenhagen, 1954, page 29.

36. Schwarz, W., and Dettmer, N.: Elektronenmikroskopische Untersuchung des elastischen Gewebes in der Media der menschlichen Aorta. *Virchows Arch. f. Path. Anat., 323:* 243-268, 1953.

37. Schwarz, W.: Elektronenmikroskopische Untersuchungen über die Differenzierung der Cornea und Sklerafibrillen des Menschen. *Ztschr. f. Zellforsch., 38:* 78-86, 1953.

38. Schwarz, W., and von Pahlke, G.: Elektronenmikroskopische Untersuchungen an der Interzellularsubstanz des menschlichen Knochengewebes. *Ztschr. f. Zellforsch., 38:* 475-487, 1953.

39. Strobel, H.: Die Gewebsveränderungen der Haut im Verlaufe des Lebens. *Arch. f. Dermat. u. Syph. 186:* 636-668, 1948.

40. Tattersall, R. N., and Seville, R.: Senile Purpura. *Quart. J. Med., 19:* 151-159, 1950.

41. Tunbridge, R. E., Tattersall, R. N., Hall, D. A., Astbury, W. T., and Reed, R.: The Fibrous Structure of Normal and Abnormal Human Skin. *Clin. Sci., 11:* 315-331, 1952.

42. Unna., P. G.: *Histopathology of the Diseases of the Skin.* Transl. by Norman Walker, Macmillan, New York, 1896, page 984.

43. Von Pahlke, G.: Elektronenmikroskopische Untersuchungen an der Interzellularsubstanz des menschlichen Sehnengewebes. *Ztschr. f. Zellforsch., 39:* 421-430, 1954.

44. Wolpers, C.: Zur elektronenmikroskopishen Darstellung elastischer Gewebselemente. *Klin. Wchnschr., 34:* 169-172, 1944.

STUDIES OF GROWTH THROUGHOUT THE LIFESPAN IN JAPANESE: GROWTH AND SIZE OF NAILS AND THEIR RELATIONSHIP TO AGE, SEX, HEREDITY, AND OTHER FACTORS*

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Reasonably accurate and quantitative measurements can be made of the growth of structures like the nails which proliferate throughout the lifespan. These studies escape the limitations of investigations of growth in terms of increments of height and weight, which disappear after an adult form is attained, except for cases in which adipose tissues accumulate.

Many scholars, including Muller (49), Gerard (23) and Needham (53), have emphasized the similarity of processes in which protein molecules are replicated, whether this be in the production of small units like enzymes and antibodies or the reproduction of genes to form a cell or an entire organism. In so far as growth of the nail may reflect the metabolism and growth of other bodily structures, studies of this integumental appendage can provide, at any age, quantitative assessments of metabolism and growth that are applicable to other structures as well as skin. The existence of a parallel between nail growth and bodily metabolism in general has been described by Needham (53) as follows: "replacement of hair, nails . . . logically extends to the molecular level, to the 'metabolic turnover' of the biochemist (33) . . ." and "followed back to its origin at the molecular level, regeneration becomes identical with the metabolism of maintenance . . ."

The present communication establishes standards for the nail growth at successive ages and analyzes for Japanese subjects some of the factors which might conceivably influence or be associated with periods of rapid or slow growth of nails. Reference will be made to companion studies of approximately 1,000 Caucasian subjects (29).

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MATERIALS AND METHODS

Subjects consisted of 297 males and 298 females. Their distribution according to age is shown in figure 12. All individuals were residents of Tōkyō or its environs and were in good health, as far as could be determined without detailed investigation, when studied in May, June, and July of 1954. Some of the older persons lived in a home for the aged, but neither these nor any of the other subjects were institutionalized because of poor health.

An additional study was made in the summer of 1953 of 27 young members of three large families, all of whom were Japanese subjects living in Japan. Comprehensive genetic investigations, including extensive use of serologic and other methods, strongly suggest the correctness of the familial relationships shown in figure 13.

Nail-biters were excluded from this study since biting of the nails augments the rate of growth (29, 34, 42). The increase in growth rate that accompanies biting of the nails seems to be comparable to the increased proliferative rates observed under other circumstances when cells are jostled, such as when friction is applied to the skin (60) or even when tissue cultures are subjected to movement (53).

The procedure used to measure rate of linear growth of nails is analyzed critically elsewhere (29). As employed in this study, it records the distance that an incision made upon the surface of the nail plate moves distally over a period of 6 weeks. Measurements were made with needle-point calipers with the nail viewed at a magnification of 2X. In the study of Japanese subjects the nail of the left thumb was employed and the base of the corpus unguis utilized as the stationary frame of reference. In 3 instances the right thumb was substituted because of amputation or deformity of the nail of the left hand. Rates of nail growth are similar on right and left hands

regardless of whether the subject is right or left handed (3, 29, 34, 42).

In most subjects the rate of nail growth of the thumb differs somewhat from that of other digits. We have examined the data of Hillman and Leogrande (34) for 39 young Caucasian men, finding that the mean rate of growth for the thumb was 9 per cent slower than that for the middle finger. In another series (29) of 6 female and 4 male Caucasian subjects the nail also grew 9 per cent slower on the thumb than on the big finger. It was also 9 per cent slower in a series of 7 male and 14 female Japanese subjects. This correction factor of 9 per cent was applied to our data for Caucasians and for the Japanese families (in whom the left maximus was the site under study).

The thickness of the nail was measured with micrometer calipers in the midline of clippings from the free edge of the nail. The proximal portion of the clippings was utilized since the distal border of the nail is known to undergo fragmentation and attrition to the extent that 50 per cent of the nail may be sloughed (3). A release mechanism prevented undue compression of the nail by the jaws of the micrometer calipers. Debris, especially adherent epithelial cells, was scraped from the undersurface of the clippings before measurements were made of the thickness of the nail. Scraping was done with a sharp razor blade while the clipping was examined at a magnification of 5X.

The length of the nail plate was measured in the midline of the thumb with needle-point calipers placed between the hyponychium and the base of the nail plate. Longitudinal curvature of the nail introduced an error which was small in magnitude but differed in an undetermined amount from subject to subject.

The greatest breadth of the nail was also measured *in situ* with needle-point calipers. Because of the medio-lateral curvature of the nail this value does not represent the true width of the nail. The extent to which the measurements differed from the true width was considerable in some subjects.

The "nail index" is breadth (mm.) ÷ length (mm.) × 100.

The number of days required for replacement of the nail plate, i.e., for the nail to grow from the base of the corpus unguis to the hyponychium, was calculated from the length of the nail plate (mm.) ÷ daily rate of growth (mm.)

The rate of volumetric growth of nail per day was calculated by thickness (mm.) × breadth (mm.) × length grown per day (mm.).

Height of the subjects was measured after removal of footgear. Weight was recorded with the subjects either undressed or wearing a light cloak of known weight.

The thickness of skinfolds was measured with calipers designed and standardized by Keys (40). Each jaw has a surface area of 40 sq. mm. The jaws are compressed by a spring with a constant force of 10 Gm./mm.^{2}. The site selected for study was the posteromedian surface of the arm midway between the elbow and the shoulder, an area accessible for study and commonly used as one index of the amount of bodily fat (19, 63).

Growth and function of other integumentary structures were also studied. Axillary hair was measured in terms of weight of the full-grown mass and weight of hair grown per day as recorded for a period of 6 weeks. The method for obtaining, cleaning, and drying the samples has been described (26). The beard grown during 48 consecutive hours was collected with a special electric shaver designed to retain the shavings. A detailed procedure has been devised for cleaning, drying, and weighing of shavings (28).

Sebum was measured by a method similar in principle to that described by Jones, Spencer, and Sanchez (37). The incidence and severity of acne were tabulated in accordance with categories established by Bloch (7). The occurrence and extent of common baldness were classified according to the categories defined by Hamilton (27).

Titers of ketosteroids in urine collected for 48 consecutive hours were measured according to the technique described by Lieberman and associates (43).

RESULTS

Reliability of measurements. Thickness of nail clippings from 10 subjects was measured in three places, the midline (mean of 0.58 mm.) the lateral edge (mean of 0.53 mm.), and midway between the midline and the lateral edge (mean of 0.57 mm.). No appreciable error ($P = 0.78$) is introduced if the site of the reading is displaced from the

midline by ± 1.0 mm. in small children or by ± 3.0 mm. in adults.

As studied in 6 subjects, desiccation for 24 hours reduced the mean thickness of nail clipping by only 0.01 mm., a difference within the range of error in duplicate micrometer measurements made of the same specimen under identical conditions. Exposure overnight to a maximally humid environment increased the mean thickness of clippings from 5 subjects by only 0.02 mm. ($P = 0.67$). Therefore measurements of the nails were made without regard to their hygroscopic properties.

Three readings were taken routinely of the thickness of each nail clippings as measured in the midline. In almost all instances the values agreed within ± 0.005 mm. Values were rejected if they varied by more than ± 0.02 mm. Rejected samples were found upon microscopic inspection to have ridges or gouges. As tested in 18 subjects, the values for thickness of 3 successive clippings of the same nail agreed within ± 0.01 mm.

To test the reliability of data for the rate of linear elongation, measurements of the distance between a scratch on the nail and the hyponychium were repeated 7 times at minute intervals on 10 digits. These multiplicate readings had an average S.E. of ± 0.1 mm. The average error in recording linear growth would be 3 per cent in a nail which grew at an average rate of 0.15 mm. per day for 6 weeks. It would be 9 per cent in a nail growing 0.05 mm. per day for 6 weeks. These rates of growth represent the extremes observed in this study. Thus it was not considered necessary to extend the period of observation in order to increase the distance that the incision migrated distally and thereby reduce the possible error in measurement.

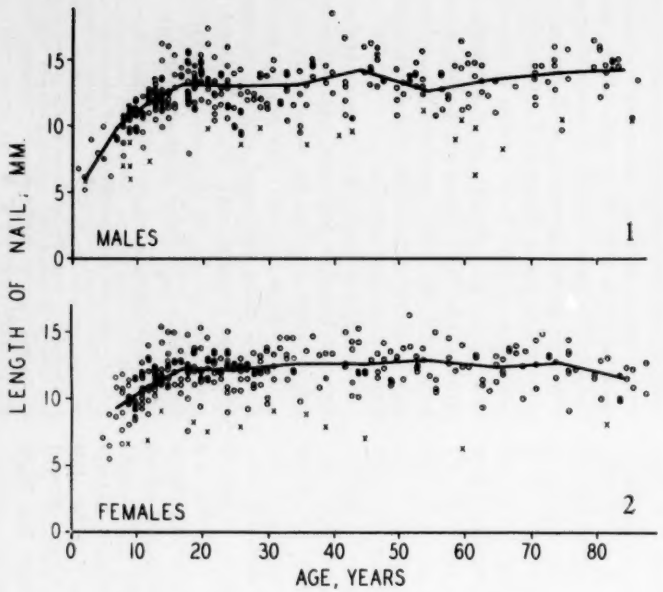
The extent to which the value for linear growth during one period of 6 weeks provides a true index of the growth of that nail may vary with the status of the subject. Seasonal variations have been described (42) but are not always observed (3, 4, 34). Children undergo marked seasonal spurts of growth as reflected in increments of height and weight (56) and it is possible that seasonal variation is more pronounced in immature than in adult subjects. Among adults the rate of nail growth, as studied in one man, has been found to be relatively constant in measurements at 11 intervals between 15 and 115 days (29). Hillman and Leogrande (34) found a mean variation of 0.0035 mm. (range of zero to 0.016 mm.) in 261 measurements of 99 men. Variation from time to time in the same individual was marked in only a few of the males but in a somewhat larger proportion of females studied in a similar fashion. It is uncertain whether the tendency to variation in growth rate in some subjects was due to internal physiologic factors, or to intercurrent influences such as mild illness, and differences in pressure upon the nails as a result of piano playing. Undoubtedly the rate of nail growth can be reduced by illness (3), severe starvation (35), and immobilization or paralysis of the digits (32, 47), and can be increased by physiologic factors such as pregnancy (25) and by external stresses such as are incurred in biting the nails and playing the piano. The available data do not permit definitive analysis, however, of the extent to which time-to-time variation, which is marked in certain persons especially among females, is due to internal physiologic factors and how much is due to external stress directed specifically on the nails.

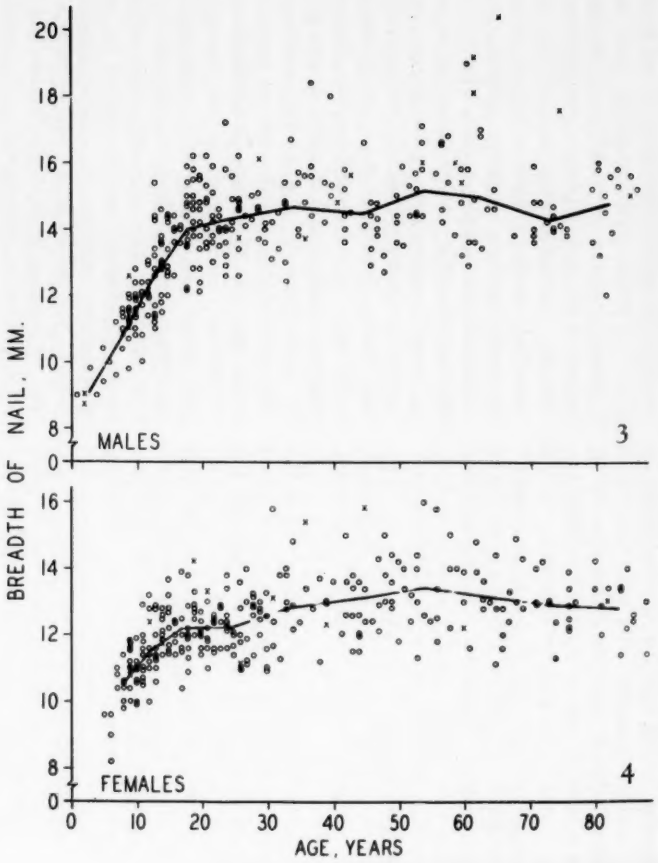
Although there are differences from person to person as to which nails grow fastest and differences in rate of growth of the various nails in the same subject, it seems that measurements of one particular nail are as representative as values for several nails. The comparability of data from person to person, as studied in 10 subjects at 4 intervals of 6 weeks each (29), was as good when based on values for one nail (maximus) as when calculated from mean values for 4 nails (pollex, index, maximus, annulus).

Data for subjects with racquet thumbs* were excluded in statistical analyses since the values were atypical in many respects.

Dimensions of nails. Values for length of the nail plate increased rapidly during the first two decades and attained almost their maximum in the 15-19 year-old group, both in males and females (figs. 1 and 2). This

*_Nail en raquette_ is described in Blakiston's New Gould Medical Dictionary (5) as follows: "A dystrophy of the nail in which the nail, usually that of the thumb, appears wider than normal, its transverse curvature diminished so that the nail seems flat. The effect is that of a miniature tennis racket." Actually, as shown in the present study, the deformity is associated with subnormal length. The breadth of the nail is only slightly greater. Moreover, the racket phalanx occurs commonly on the big toe as well as on the thumb.





Figs. 1 to 4 show individual values for length and breadth of the left thumbnail at successive ages. The curve is drawn through mean values for years 1-4, 5-9, 10-14, 15-19, and for decades thereafter. Data for subjects with a racket deformity of the left thumb are represented by an X and are not included in averages for any age group.

NAIL INDEX
$\frac{\text{BREADTH}}{\text{LENGTH}} \times 100$

corresponds to the age when growth of the somatic tissues in general was largely completed as indicated by measurements of bodily height. Mean values for length of the nail plate did not change materially in subsequent decades.

Breadth of the nail plate increased rapidly during the first two decades and continued to do so at a slower rate thereafter through the sixth decade (figs. 3 and 4). Breadth was significantly greater ($P = 0.001$) in the sixth than in the third decade. The gradual increase in breadth with aging may be due to flattening of the nail or to an increase in dimensions of the cells, but studies were not undertaken to analyze either of these possibilities.

In subjects with racquet thumbs the mean length of the nail was 68 per cent of the average for their respective age groups, whereas the average breadth was slightly greater (108 per cent).

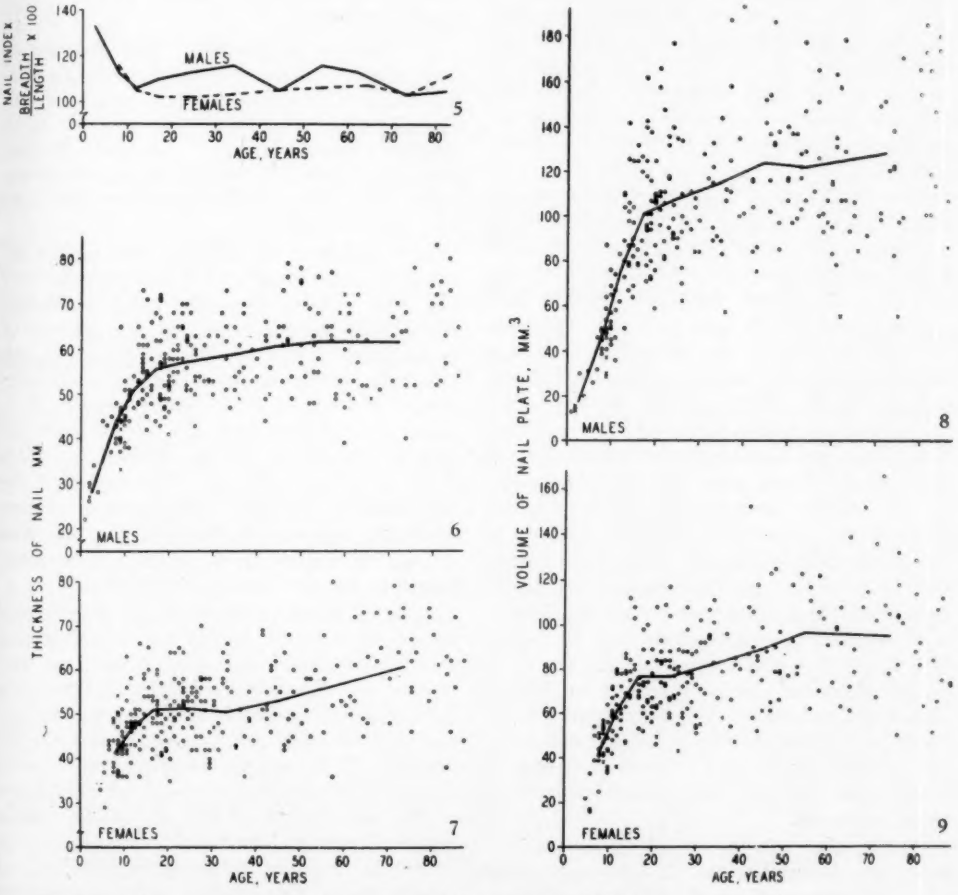


Fig. 5 is of the curves of mean values per decade for the nail index.

Figs. 6 and 7 show the increase in the thickness of nails throughout life and the greater thickness of nails in men than in women. A single mean is employed for values for the seventh through the ninth decades.

Figs. 8 and 9 portray the volume of the nail plate. A single mean is employed for the seventh through the ninth decades.

The nail index (fig. 5) decreased rapidly during the first 1½ decades and remained relatively constant thereafter.

Thickness of the nail increased rapidly during the first two decades and at a slower rate thereafter throughout life (figs. 6 and 7). The difference between values for the third decade and those for the sixth through the ninth decades was significant ($P = 0.01$ in males, 0.001 in females).

Nails were significantly thicker ($P < 0.001$ in men than in women, as tested from the third through the ninth decades inclusive.

The volume of the nail plate increased rapidly during the first two decades, more slowly thereafter (figs. 8 and 9). This is due to increases in all three dimensions during the first two decades and mainly to further increases in thickness and width after the second decade.

Rate of Growth of Nails. 1). *Linear growth.* Peak values for rate of elongation were reached in the 10-14 year-old group in both males and females. After the second decade the rate of growth declined steadily and materially (figs. 10 and 11). In comparison with values for the second decade this decrease in rate of growth was statistically significant by the fifth and all later decades ($P = 0.01$) as tested separately for each sex. The further decline between the fifth and the eight decades was also significant in males ($P = 0.002$), questionably so in females ($P = 0.02$). The lack of further decline in the ninth decade may be spurious, possibly the result of the small number of aged subjects available for this study, since the decline was observed to continue (fig. 12), in studies of a larger group of Caucasians (29).

The shape of the curve was not altered significantly at the age for the menopause and there was no statistically significant difference ($P = 0.60$) in rate of growth between 14 menopausal and 22 premenopausal women 40 to 59 years old.

2). *Number of days required for replacement of the nail plate, i.e., for movement of an incision on the nail plate from the base of the corpus unguis to the hyponychium* (figs. 14 and 15). The curve of increase in mean number of days required for replacement of the nail plate was steepest in children and adolescents, associated in large part with lengthening of the nail plate along with enlargement of other bodily structures. After the second decade the time required for replacement increased at a slower rate. This slower replacement of the nail plate with aging is due mostly to the declining rate of linear nail growth and little to further elongation of the nail plate.

The range of time required at each age for replacement of nails of various lengths can be estimated from figures 14 and 15, thus defining the greatest intervals during which measurements can usually be made with a single marking.

3). *Volumetric growth.* The volume of nail grown per day increased markedly during the first two decades but was relatively constant from the third through the ninth decades (figs. 16 and 17). In effect, the decline with aging in rate of linear elongation was counterbalanced by increments in thickness and breadth.

In calculations of volume, two of the dimensions (thickness and linear growth rate) are more reliable than the third (breadth) which was not corrected for the amount of mediolateral curvature. Two-dimensional values, based on the relatively accurate measurements of thickness × linear growth rate, showed no change after the third decade except in the oldest groups of men in which there were few subjects. The fact that the two-dimensional values underwent no change with age again indicates that the decrease in rate of elongation is practically counterbalanced by the increase in thickness.

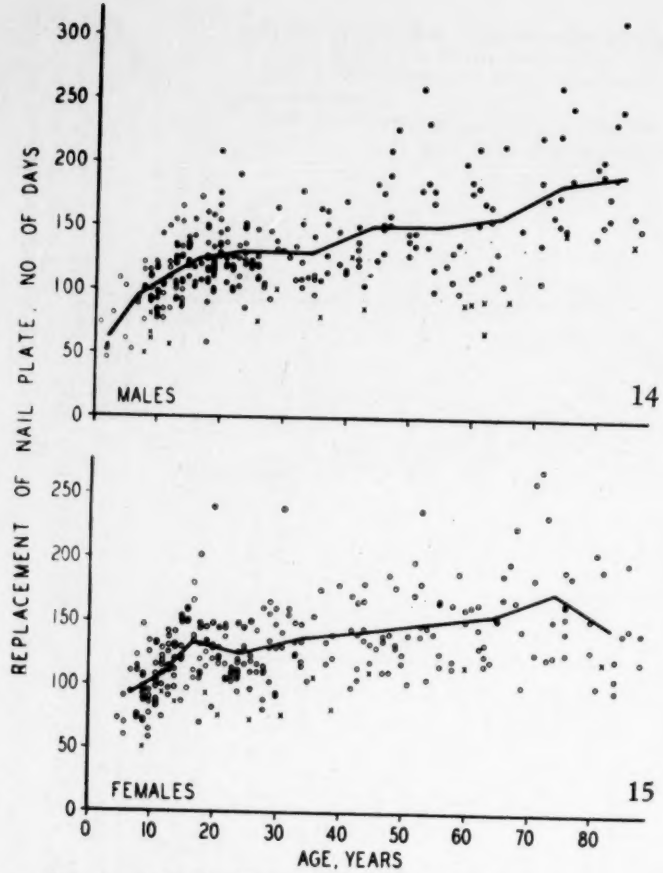
Lack of relationship of linear growth rate to size of the nail, bodily mass, and growth of integumentary appendages which are secondary sex characters. As tested separately for males and females in three age groups, before puberty (1-8 years) and in young (25-34) and old (70-88) adults, the rate of nail growth was not significantly correlated with thickness of the nail, length of the nail plate, bodily height, bodily weight, nutritional status as assessed in terms of thickness of skinfolds of subcutaneous fat, degree of development (weight of full-grown mass) of axillary hair, rate of growth of axillary hair or beard, and the incidence and severity of acne and common baldness.

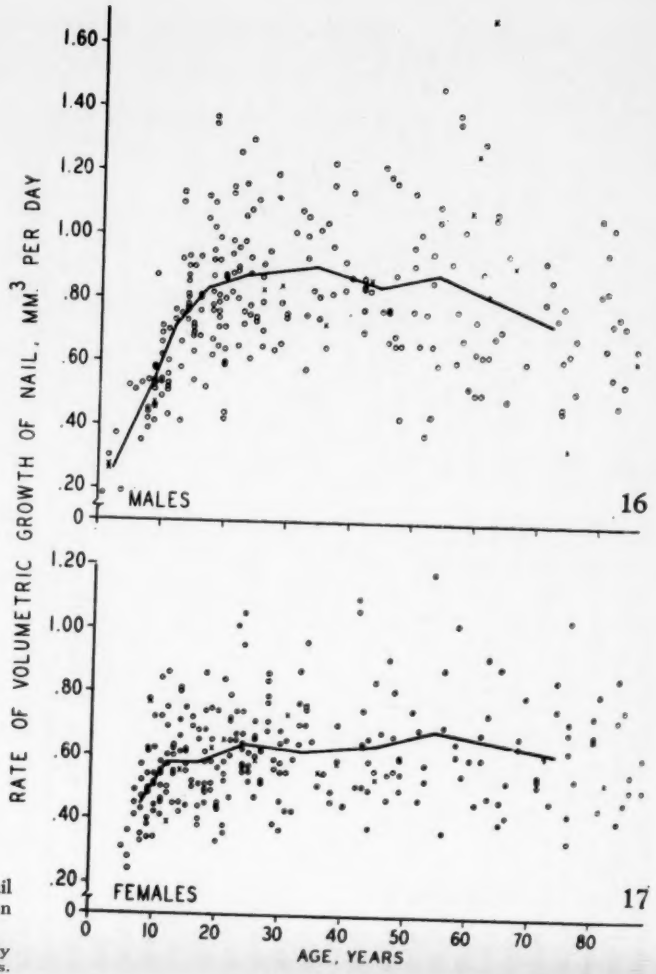
The rate of linear elongation of nails was

Figs. 10 and 11 show the decline with age in rate of linear nail growth.

Fig. 12 suggests that the decline with age in rate of linear growth proceeds similarly in Japanese and Caucasian subjects.

Fig. 13 shows that both male (represented in black) and female (represented in white) siblings tend to exhibit the rate of nail growth characteristic of their families. The large symbols show the mean value for all siblings of that family after correction for the influence of age and sex (see footnote* page 410).





FIGS. 14 and 15 show the number of days required for replacement of the nail plate and indicate for each age the length of time during which nail growth can usually be studied with a single marking.

FIGS. 16 and 17 show that the rate of volumetric growth changes only slightly with age. A single mean is employed for the seventh through the ninth decades.

only slightly elevated at the 14th year in males and the 12th year in females, the years in adolescence when increments in bodily height and weight were exceptionally great. Final conclusions cannot be drawn as to the presence or absence of parallel increases in rates of growth in nails and other somatic tissues in the years of peak growth in adolescence, since measurements of nail growth were restricted to May through July. This is a time in Japan when somatic growth is much less rapid than in autumn.

Aging. Statistically significant changes with aging included a decrease in rate of linear growth and increases in thickness, in breadth of the nail plate (through the sixth decade), and in the extent of inter-subject variation in values for some items.

A decrease with aging in rate of linear nail growth was suggested by Voit's data (65) for three subjects of different ages and by Bean's study (3) of himself for a decade, but these suggestions were not supported by the more extensive studies carried out prior to the present report. Le Gros Clark and Buxton (42) found no difference in growth rate between the 10th and 23rd years. In Bloch's data (6), apparently published only as generalities in an abstract referring to a supposedly large but unstated number of subjects, the rate of elongation increased to reach adult levels by the third year of life and was maintained at this rate until the end of the fourth decade. A further plateau at a slightly reduced rate was reported for the fifth and sixth decades with no marked reduction of rates of growth until the seventh decade. Edwards and Schott (20) observed no effect of age upon rate of growth of toenails in 70 subjects of both sexes 3 to 65 years of age. It would seem that the present data for Japanese and Caucasians provide the only substantial study throughout the lifespan and proof that reductions in linear growth rate are statistically significant. Hillman and Leogrande (34) have unpublished data for Caucasians in keeping with the present findings of reduced growth with aging.

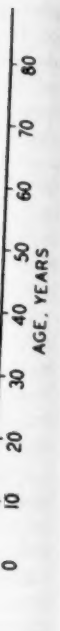
The present data are in harmony with the decline upon aging in growth of axillary hair (26) in man and of the pelage in animals (14, 16, 18) and of the desquamation of epithelium (39). With aging there is a decrease in the rate of regeneration of the liver (9, 44, 54) and in its capacity for growth when cultured *in vitro* (24). Aging also reduces the ability of other tissues to grow *in vitro* (22), the capacity for regeneration of limbs in crustacea (51, 52), and of various portions of the body in some but not all animals (58, 69).

In both series of Japanese subjects employed in the present study, the genetically unrelated persons (fig. 10) and the siblings in three large families who were studied as a separate project (fig. 13), the rate of linear growth among males tended to be highest in the second decade and to decline thereafter. A similar peak was not observed in female siblings of the large families (fig. 13). This "watershed" appearance of the age curve for values in males, in conjunction with the greatest sex difference in linear nail growth rate in the 10-19 year-old group (see below), suggests that the high growth rate for males in the second decade is real and may be a reflection of the marked somatic growth of males during adolescence. The healing of skin wounds in man is known to be more rapid during adolescence than thereafter (55).

The extent of variation of values from subject to subject, as tested in data combined for males and females between 20 and 89 years of age, increased significantly with regard to days required for replacement of the nail plate (with the third decade as the frame of reference, $P = 0.01$ by 40-59 years and 0.002 by 70-89 years) and thickness of the nail ($P = 0.02$ by 40-59 years and 0.002 by 70-89 years), but not with regard to length, width or volume of the nail plate or volume of nail grown per day. Shock (61) has reported that aging is accompanied by greater variation among subjects in most homeostatic phenomena.

Heredity. Familial tendencies in rate of linear elongation of nails (fig. 13) seem to be distinctive. Both male and female siblings tended to conform to the growth rates that were characteristic of the family. Five of the 6 parents of the families had low rates as expected at their age, and did not exhibit the differences in rates that typified younger members of their families.

The difference in mean rate of nail growth



FIGS. 16 and 17 show that the rate of volumetric growth changes only slightly with age. A single mean is employed for the seventh through the ninth decades.

between members of the H and I families* is statistically significant ($P = 0.001$) even with this limited number of siblings. The mean growth rate in the K family is intermediate between those for the H and I families and is significantly different from that of the I family ($P = 0.01$) but not the H family ($P = 0.15$).

Genetic regulation of the linear growth rate of nails was also observed in unpublished studies of identical twins in whom nail growth was more similar than in fraternal twins or in unrelated subjects of the same age.

Familial tendencies in rate of linear nail growth resembled familial tendencies in titers of urinary ketosteroids† in some respects but were not correlated either with the amount of sebum excreted normally (or after removal of the oily film from the skin) or with the rate of growth of axillary hair or beard in the families.

After adjustment for age,* the degree of variation (S.D.) among subjects in linear growth of nails was 0.0135 mm. among siblings of the H family, 0.0076 mm. in the K family and 0.0078 mm. in the I family. The degree of variation was significantly greater ($P = 0.005$) in the H family than in the K or I families. The variation between pairs of siblings from different families was not significantly greater, however, than between pairs within the same family.

The thickness of nail clippings (for members of the families who were 18 or more years of age) was found, after adjustment for age and sex,* to be greater in the K family than in the I family ($P = 0.005$) or in the H family ($P = 0.02$).

*The comparison between families was made after adjustment of the raw data for differences in the age of subjects and in the rate of nail growth of the digit under study. The nail growth rate for the big finger, which was the site used in studies of families and twins, was reduced 9 per cent to correct for the slower growth rate of the thumbnail (see Materials and Methods). The data for unrelated persons (see figs. 10 and 11) permitted adjustment to be made for differences in age. With values for the 10-19 year-old group as a base line, the mean rate in males was 0.002 mm. less at 5-9 years, 0.006 mm. less at 20-32 years. In females it was 0.001 mm. more at 5-9 years and 0.001 mm. less at 20-34 years.

†Familial tendencies in titers of urinary ketosteroids as studied in members of these families who were 18 to 34 years of age, corresponded to familial trends in nail growth, in that values were highest in the H family, intermediate in the K family, and lowest in the I family. After adjustment of data for the lower values of ketosteroids in females, statistically significant differences were observed between the H and K families ($P = 0.007$) and the H and I families ($P = 0.001$). These familial tendencies in ketosteroid titers, like those in rate of nail growth, were exhibited by siblings of both sexes.

Sex differences. As tested in subjects of all ages, the mean value for daily rate of linear growth of nails was 0.006 mm. faster in males than in females ($P = 0.001$). Mean values per decade tended to be higher in males than in females until the eighth decade, but only in the 15-19 year old group was the difference statistically significant ($P<0.001$). After the second decade the tendency to faster growth in males amounted to 0.003 mm. per day, a factor of only 3 per cent. From 20 to 69 years of age (i.e., omitting the eighth and ninth decades when growth was actually less rapid in males than in females) the sex difference as tested in 142 males and 155 females was significant only at the 2 per cent level.

Sex differences in rate of linear elongation of nails were not significant in most studies of Caucasians (20, 29, 42), although for a limited range of age in young adults slightly higher rates have been observed in males (34). There is also a divergence in data for rate of growth of scalp or bodily hair (16, 31, 50, 57, 66, 67), but the majority of reports show little or no difference between the sexes.

As tested between 20 and 89 years of age, values were significantly greater ($P<0.001$) in males than in females for volume of the nail grown per day and for growth in two (rate of elongation per day $\times$ thickness) and three dimensions. The greater volume in males than in females, amounting to 0.18 cu. mm., or 28 per cent, is due to the fact that all dimensions of the nail were significantly greater in males than in females.

No conclusion can be drawn at present as to whether the greater thickness of nails in males than in females is due to differences in size or number of cells. A larger size of cells in males than in females would be in keeping with the decrease in cellular size reported upon castration and the increase induced by androgenic stimulation not only in sexual organs (48) but also in other tissues and organs (13, 30, 36, 38, 41).

After adjustment for age the variation in thickness of nails from subject to subject was no greater in females than in males, either among the unrelated persons or among siblings of large families ($P>0.10$ for the H family, 0.025 for the K family, and >0.10 for the I family).

Comparison of Japanese and Caucasian data. The mean values for daily rate of elongation and their slopes of decline with aging (fig. 13) are similar in Japanese and Caucasians. Adult Caucasians did not exhibit a sustained trend to sex differences in rate of linear growth.

DISCUSSION

Elongation of nails as an index of growth. Growth of the nails can be measured in a quantitative fashion with simple procedures. These measurements can sum up the amount of growth over extended intervals of time or can be limited to periods as short as one week (2) or a few hours (29). Moreover, growth of the nails can be investigated throughout the lifespan.

There is biologic and biochemical evidence (23, 49, 53) that studies of nails can serve to gauge growth and metabolism not only of integumental appendages, but also of other bodily structures and perhaps of the body as a whole. Delineation of the extent of parallel between the metabolic status of nails and other structures will require considerable study, but proof that a parallel exists may be summarized in the next paragraph.

The present study shows a marked and statistically significant decline with aging in linear growth of nails in humans that is similar to the decrease with age in regeneration rates in other species (51, 52). Presumably this decline is part of a body-wide reduction with age in proliferation (9, 10, 64) and metabolism (44, 62). The growth rate of nails has been reported (3) also to be slowed as a result of a body-wide viral infection, mumps. Unpublished studies of rodents have shown that linear growth of the nails is decreased: 1) in a graded manner when the gain in body weight is progressively reduced by partial starvation; 2) during lactation; and 3) as a result of administration of antimitotic drugs. The rate of nail growth can be increased in association with phenomena affecting other parts of the body, such as in pregnancy (25) which is presumably accompanied by a general enhancement of growth processes.

The question may be raised as to why linear elongation did not proceed with much greater rapidity in children than in young adults. Several explanations seem possible. One is that the present study was made at a season of the year when somatic growth is relatively meager; perhaps higher rates of nail and somatic growth might be found in parallel at another season. It is also possible that growth is proceeding virtually at a maximum throughout much of the first two or three decades of life so that during this time gradations are no more extreme in nail growth rates than in other physiologic variables like basal metabolism (59). It should be noted, too, that if the rate of elongation of nails is considered in relation to the smaller dimensions of nails in children than in adults, the linear growth rate per unit mass of nails is relatively high in children.

The purported growth of integumental structures after death of the organism requires comment if nail growth is supposed to parallel growth and metabolism of other tissues. In studies of several tissues including epithelium, Bullough (11, 12) has shown that if a cell begins to divide before death of the organism mitosis continues to completion. New mitoses are not begun. Much of the supposed growth of integumental appendages after death is described by Cowdry (15) as apparent rather than real, since in actuality most of the postmortem changes are due to shrinkage of the soft tissues rather than to growth of integumental appendages.

The increase in thickness of the nails throughout adult life may be due to greater stratification but it seems more likely that it represents an increase in cell size such as has been claimed to occur in many different tissues (1, 8, 17, 21, 41, 46, 68). If cells increase in all dimensions, their greater proximo-distal size would tend to counteract the decline with age in rate of linear elongation of the nail. If it were assumed that the percentage increase in thickness (mean of 12 per cent in males and 20 per cent in females in comparisons of the 20 to 29 year-old group with those 70 to 89 years of age) is due to greater thickness of the cells and that the proximo-distal dimension of the cells is increased to a similar degree, the adjusted data for proliferative rates in the 70 to 89 year-old group would be 0.068 mm. in males and 0.064 mm. in females; in comparison with the rate of elongation in the third decade (0.105 mm. in males, 0.100 mm. in females) the decrease

by the seventh and eighth decades would be 35 per cent in males and 36 per cent in females. The measured decline in linear elongation was 27 per cent in males and 20 per cent in females.

An increase in thickness with aging is observed not only in nails but also in hairs of various sites such as eyebrow, nasal vestibule, and external ear. This increase in thickness with aging is proportionally as great in females as in males as regards nails but not in hairs of the sites referred to above.

Changes with aging. The steady and substantial decrease with age in rate of linear nail growth, the tendency to which is tentatively assumed to begin after sexual maturation, sheds some light on the processes responsible for aging. One of the chief theories as to the cause of aging, propounded by Minot (46) and vigorously championed by later workers, is that aging is the consequence of differentiation of cells in that differentiation results in loss of proliferative properties. Although there is little doubt that differentiation is accompanied by decreased mitotic rates (53), a decline in proliferative rates can also occur with aging of the nail matrix, a structure that does not seem to differentiate further with advancing age. Hence, progressive differentiation would seem to be neither a cause nor an accompaniment of the decline in proliferative rates of the nails.

The decrease in nail growth with aging does not represent simply a decline in the function of postmitotic cells such as is observed in skeletal muscle fibers or neurons, but is an expression of reduction in the capacity of newly-derived daughter cells to undergo further proliferation. Essentially, however, the decrease in function with age seems to be the same (53) whether it involves metabolic turnover or growth.

Judged by rate of linear elongation of nails, a decline in growth follows attainment of high values at about the time of sexual maturation, at least in males. The validity and magnitude of this peak cannot be appraised until studies are carried out which take into account the possibility of seasonal influences upon growth rates, especially in young organisms. It seems that at least some aspects of senescence are initiated or accelerated after sexual maturation. McCay has (45) used the technique of partial starvation in rats to extend the prepubertal period to several times its normal length, with consequent prolongation of life. After maturation had occurred, though, starvation no longer prolonged survival to the same extent observed with starvation prepubertally. The effects of sexual maturation seem to be only additive, however, for senescence occurs after prepubertal castration as well as in the intact organism.

One of us (J.B.H.) has explored the concept that a central feature of many aging proceesses is a decrease in the ability for replication of cell constituents (including function, replacement and growth of cells). This decrease is probably, in part, secondary to changes (22) occurring in tissues and fluids elsewhere in the body. Fibroblasts, when cultured *in vitro*, are able to survive long beyond the usual lifespan of the animal from which they were obtained (22), but similar success with a variety of other tissues has yet to be reported. At present it is not possible to define the extent, if any, to which the diminution in rate of nail growth with age is primary, that is, due to changes in the vital properties of individual cells of the nail.

The distinction between primary changes (which probably differ in various cells and with genetic constitution) and secondary changes (due to influences originating in other parts of the organism) is crucial to the understanding of aging processes and may aid in defining the pathogenesis of diseases that accompany aging. Perhaps transplants of nail buds between donors and hosts of different ages would help to clarify which changes are "normal" (i.e., usual) accompaniments of the decline with age in metabolism, replacement and growth *vs.* those which are pathologic.

SUMMARY

Evidence from this and other studies indicates that growth of structures like the nails, which proliferate throughout the lifespan, reflects the function, replacement and growth of the various other bodily structures. In so far as such a parallel exists between growth of the nails and other parts of the body, simple and reasonably accurate observations of these superficial structures can provide quantitative appraisals of the metabolism and replacement of protoplasm at all ages.

In view of the above considerations, growth of the nails was studied in healthy subjects, 297 male and 298 female Japanese, 1 to 89 years of age. Supplementary studies to test the influence of genetic factors were carried out in 27 young siblings of three large families. The reliability of the methods employed was examined critically and simple procedures were shown to suffice when the periods of study extended as long as 6 weeks.

Linear elongation of the nails was most rapid in the first and second decades of life. Growth decreased steadily and to a highly significant extent thereafter.

The rate of linear growth of nails was not significantly related to thickness of the nail; length of the nail plate; bodily height or weight; nutritional status as assessed in terms of thickness of skinfolds; rate of growth of the secondary sex characters, axillary hair and beard; degree of development of axillary hair; and the incidence or severity of acne and baldness.

The decline with aging in proliferative rates of the nail matrix, a structure which does not seem to differentiate further with aging, is evidence against the widely held theory that aging is the consequence of differentiation because differentiation reduces proliferative capacities. The present studies are interpreted as evidence that a central feature of many aging processes may be a decrease in the capacity of replication of cell constituents including function, replacement and growth of cells.

The thickness of the nail increased rapidly in the first two decades, more slowly thereafter. The increase in thickness with aging counterbalanced the decline in linear growth so that the volume of nail grown per day changed but little with aging.

Hereditary factors exert statistically significant influences upon rate of nail growth. Both male and female siblings tend to conform to the rate of nail growth characteristic of their family. This is in keeping with the finding that rate of nail growth was more similar in identical twins than in unrelated subjects of the same age.

REFERENCES

1. Arataki, M.: On the Postnatal Growth of the Kidney, with Special Reference to the Number and Size of the Glomeruli (Albino Rat). *Am. J. Anat., 36:* 399-436, 1926.
2. Babcock, M. J.: Methods for Measuring Fingernail Growth Rates in Nutritional Studies. *J. Nutrition, 55:* 323-336, 1955.
3. Bean, W. B.: A Note on Fingernail Growth. *J. Invest. Dermat., 20:* 27-31, 1953.
4. Berthold, A. A.: Beobachtungen über das quantitative Verhältniss der Nagel- und Haarbildung beim Menschen. *Müller's Arch. f. Anat., Physiol. u. wissenschaft. Medicin,* 156-160, 1850.
5. *Blakiston's New Gould Medical Dictionary.* Blakiston Co.; Philadelphia, 1949, 1st ed.
6. Bloch, A. M.: Étude de la Croissance des Ongles. *Compt. rend. Soc. de Biol., 1:* 253-255, 1905.
7. Bloch, B.: Metabolism, Endocrine Glands and Skin Diseases with Special Reference to Acne Vulgaris and Xanthoma. *Brit. J. Derm. & Syph., 43:* 61-87, 1931.
8. Buccianti, L., and Luria, S.: Struttura dei muscoli voluntari dell'uomo nell senescenza. *Arch. Ital. di Anat. e Embryol., 33:* 110-187, 1934.
9. Bucher, N. L., and Glinos, A. D.: The Effect of Age on Regeneration of Rat Liver. *Cancer Research, 10:* 324-332, 1950.
10. Bullough, W. S.: Age and Mitotic Activity in the Male Mouse, *Mus musculus,* L. *J. Exper. Biol., 26:* 261-286, 1949.
11. Bullough, W. S.: Completion of Mitosis After Death. *Nature, 165:* 493, 1950.
12. Bullough, W. S.: Mitotic Activity in the Tissues of Dead Mice, and in Tissues Kept in Physiological Salt Solutions. *Exper. Cell Res., 1:* 410-420, 1950.
13. Caridroit, and Szuman: Quoted by J. Jasienki (36).
14. Collins, H. H.: Studies of Normal Moult and of Artificially Induced Regeneration of Pelage on *Peromyscus. J. Exper. Zool., 27:* 73-99, 1918.
15. Cowdry, E. V.: *A Textbook of Histology.* Lea and Febiger, Philadelphia, 1950, 4th ed.
16. Crary, D. D., and Sawin, P. B.: Some Factors Influencing the Growth Potential of the Skin in the Domestic Rabbit. *J. Exper. Zool., 124:* 31-62, 1953.
17. Dawborn, M. C.: The Nucleo-Cytoplasmic Ratio of the White Mouse and Its Variation with Age. *Australian J. Exper. Biol. & M. Sci., 9:* 213-226, 1932.
18. Dry, F. W.: The Coat of the Mouse *(Mus musculus). J. Genetics, 16:* 287-340, 1926.
19. Edwards, D. A. W.: Observations on the Distribution of Subcutaneous Fat. *Clin. Sc., 9:* 259-270, 1950.

20. Edwards, L. P., and Schott, R. G.: The Daily Rate of Growth of Toe Nails. *Ohio J. Sc., 37:* 91-98, 1937.
21. Eycleshymer, A. C.: The Cytoplasmic and Nuclear Changes in the Striated Muscle Cells of *Necturus. Am. J. Anat., 3:* 285-310, 1904.
22. Fischer, A.: *Biology of Tissue Cells.* University Press, Cambridge, England, 1946.
23. Gerard, R. W.: Experiments in Microevolution. *Science, 120:* 727-732, 1954.
24. Glinos, A. D.: The Effect of Regeneration on the Growth Capacity of the Rat Liver *in Vitro. Anat. Rec., 103:* 456, 1949.
25. Halban, K., and Spitzer, M.: Über das gesteigerte Wachstum der Nägel in der Schwangerschaft. *Monatschr. f. Geburtsh. u. Gynäk., 82:* 1-474, 1929.
26. Hamilton, J. B.: Quantitative Measurement of a Secondary Sex Character, Axillary Hair. *Ann. N.Y. Acad. Sc., 53:* 585-599, 1951.
27. Hamilton, J. B.: Patterned Loss of Hair in Man: Types and Incidence. *Ann. N.Y. Acad. Sc., 53:* 708-728, 1951.
28. Hamilton, J. B., and Mestler, G. E.: Quantitative Measurements of a Secondary Sex Character in Humans; Growth of a Male Secondary Sex Character, the Beard (In preparation).
29. Hamilton, J. B., Mestler, G. E., Myers, R., and Terada, H.: Rate of Growth of Fingernails Throughout the Lifespan of Caucasian Males and Females (In preparation).
30. Hamilton, J. B., and Montagna, W: The Sebaceous Glands of the Hamster. I. Morphological Effects of Androgens on Integumentary Structures. *Am. J. Anat., 86:* 191-233, 1950.
31. Hardy, T. M., and Dolnick, E. H.: Angora Rabbit Wool Production. U. S. Dept. Agriculture Circular #785: 1-22, 1948.
32. Head, H., and Sherren, J.: The Consequences of Injury to the Peripheral Nerves in Man.: Changes in the Nails Associated with Nerve Injuries. *Brain, 28:* 263-275, 1905.
33. Hevesy, G.: *Radioactive Indicators.* Interscience Publishers, Inc., N.Y., 1948.
34. Hillman, R., and Leogrande, M.: Personal communication.
35. Ivanowsky, A.: Physical Modifications of the Population of Russia Under Famine. *Am. J. Phys. Anthropol., 6:* 331-353, 1923.
36. Jasienski, J.: Influence de la Castration sur la Musculature. *Compt. rend. Soc. de Biol., 101:* 533-537, 1929.
37. Jones, K., Spencer, M., and Sanchez, S.: The Estimation of the Rate of the Secretion of Sebum in Man. *J. Invest. Dermat., 17:* 213-226, 1951.
38. Jones, V. E., and Korenchevsky, V.: Effects of Hormones in Ovariectomized Rats. II. Histologic Structure of Liver and Kidneys. *J. Gerontol., 1:* 336-344, 1946.
39. Katzberg, A.: The Influence of Age on the Rate of Desquamation of the Human Epidermis. *Anat. Rec., 112:* 418, 1952.
40. Keys, A.: Personal communication.
41. Korenchevsky, V., Paris, S. K., and Benjamin, B.: Effects of Castration and the Processes of Aging in Male Rats and Man. *J. Gerontol., 8:* 6-32, 1953.
42. Le Gros Clark, W. E., and Buxton, L. H.: Studies in Nail Growth. *Brit. J. Dermat., 50:* 221-235, 1938.
43. Lieberman, S., Dobriner, K., Hill, B. R., Fieser, L. E., and Rhoads C. P.: Studies in Steroid Metabolism. II. Identification and Characterization of Ketosteroids Isolated from Urine of Healthy and Diseased Persons. *J. Biol. Chem., 172:* 263-295, 1948.
44. Marshak, A., and Byron, R. L., Jr.: The Use of Regenerating Liver as a Method of Assay. *Proc. Soc. Exper. Biol. & Med., 59:* 200-202, 1945.
45. McCay C. M.: Chemical Aspects of Ageing and the Effect of Diet upon Ageing. In: *Problems of Aging,* Lansing, A. I., ed., Williams & Wilkins, Baltimore, 1952.
46. Minot, C. S.: *The Problem of Age, Growth and Death.* G. P. Putnam, N.Y., 1908.
47. Mitchell, S. W.: On the Growth of Nails as a Prognostic Indication in Cerebral Paralysis. *Am. J. Med. Sc., 61:* 420-422, 1871.
48. Moore, C. R., Price O., and Gallagher, T. F.: Rat-Prostate Cytology as a Testis-Hormone Indicator and the Prevention of Castration Changes by Testis-Extract Injections. *Am. J. Anat., 45:* 71-107, 1930.
49. Muller, H. J.: Life. *Science, 121:* 1-9, 1955.
50. Myers, R. J., and Hamilton, J. B.: Regeneration and Rate of Growth of Hairs in Man. *Ann. N.Y. Acad. Sc., 53:* 562-568, 1951.
51. Needham, A. E.: Growth and Regeneration in *Asellus aquaticus* (L) in Relation to Age, Sex and Season. *J. Exper. Zool., 112:* 49-78, 1949.
52. Needham, A. E.: Growth and Regeneration Rates in Relation to Age in the Crustacea. *J. Gerontol., 5:* 5-16, 1950.
53. Needham, A. E.: *Regeneration and Wound-Healing.* Methuen & Co., Ltd., London, 1952.
54. Norris, J. L., Blanchard, J., and Povalny, C.: Regeneration of Rat Liver at Different Ages. *Arch. Path., 34:* 208-217, 1942.
55. Noüy, L. Du: *Biological Time.* Macmillan Co., N.Y., 1937.
56. Palmer, C. E.: Seasonal Variation of Average Growth in Weight of Elementary School Children. *U.S. Pub. Health Rep., 48:* 211-242, 1933.

57. Pickard, J. N.: Further Studies on the Wool Production of Angora Rabbits. *Harper-Adams Util. Poultry J., 15:* 338-342, 1929-1930.

58. Prizbram, H.: Bemerkungen über das natürliche blaue Steinsalz. IV. Wachstumsgeschwindigkeit und Farbe. *Sitzungsb. d. k. Akad. d. Wissensch. Math.-naturw. Cl., Abt. 2A, 143:* 499-497, 1934.

59. Quenouille, M. H., Boyne, A. W., Fisher, W. B., and Leitch, I.: Statistical Studies of Recorded Energy Expenditure in Men. Part I. Basal Metabolism Related to Sex, Stature, Age, Climate and Race. *Commonwealth Agric. Bur., Tech. Com.* #17, Farnham Royal Bucks, England, 1951.

60. Rubin, L.: Hyperkeratosis in Response to Mechanical Stimulation. *J. Invest. Dermat., 13:* 313-315, 1949.

61. Shock, N. W.: Ageing of Homeostatic Mechanisms. In: *Problems of Aging,* Lansing, A. I., ed., Williams and Wilkins, Philadelphia, 1952.

62. Shock, N. W., and Yiengst, M. J.: Age Changes in Basal Respiratory Measurements and Metabolism in Males. *J. Gerontol., 10:* 31-40, 1955.

63. Škerlj, B., Brožek, J., and Hunt, E., Jr.: Subcutaneous Fat and Age Changes in Body Build and Body Form in Women. *Am. J. Phys. Anthropol., 11:* 577-600, 1953.

64. Sulkin, N. M.: A Study of the Nucleus in the Normal and Hyperplastic Liver of the Rat. *Am. J. Anat., 73:* 107-125, 1943.

65. Voit, E.: Über die Grösse der Erneuerung der Horngebilde beim Menschen; die Nägel. *Ztschr. f. Biol., 90:* 509-524, 525-548, 549-556, 1930.

66. Wilde, O.: Über die Beziehung zwischen Körpergewicht, Wollmenge, -dichte, -wachstum, und -wert bei Angorakaninchen. *Ztsch. f. Zücht., 40:* 407-425, 1938.

67. Wilson, W. K.: Feeding, Growth and Management in Rabbit Wool Production. *Harper-Adams Util. Poultry J., 16:* 579-583, 1930-1931.

68. Yannet, H., and Darrow, D. C.: The Effect of Growth on the Distribution of Water and Electrolytes in Brain, Liver and Muscle. *J. Biol. Chem., 123:* 295-305, 1938.

69. Zeleny, C.: Relation Between Degree of Injury and Rate of Regeneration—Additional Observations and General Discussion. *J. Exper. Zool., 7:* 513-561, 1909.

BLOOD PRESSURE AND HEART SIZE IN AGING RATS*

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As PART of a long-term program on senescence in rats blood pressures were determined in animals of various ages. The findings are reported in the present paper and are considered in relation to heart size.

MATERIAL AND METHODS

Two hundred and twenty Sprague-Dawley rats of both sexes, 138 males and 82 females, were used. The animals were raised in air-conditioned quarters with constant temperature, light and humidity. Pulmonary infection had been practically eliminated from the colony. The diet consisted of Rockland "D free" pellets. Growth curves were close to optimum standards reported by Zucker and coworkers (5) and reached peaks at 528 days in males and at 583 days in females (table 1). Subsequently, cessation of growth and loss of weight occurred when disease set in. Complete autopsies were performed upon all rats and the tissues were examined histologically. Weights of the heart and other organs were recorded.

Systolic blood pressure was determined indirectly in the unanesthetized rat by means of a photoelectric tensometer (4) which measured volume changes in the hind leg. Animals in younger age groups were in better condition than older ones but observations on the latter were made before hind leg weakness or paralysis developed (3). They were trained to become accustomed to the confinement of a holder and readings were made after experimental conditions were stabilized. The mean of 3 to 10 satisfactory consecutive readings was recorded as the systolic pressure and studies were usually repeated on successive days. Observations included a single series of determinations in rats of different ages and several readings at various intervals (68 days to 144 days) in the same animal. The total number of readings in all rats was 328. Readings were made by 3 different technicians with good correlation of values among them. Accuracy of a single determination checked simultaneously by 2 observers varied from 2 mm. to 10 mm. Electrocardiograms were made in 144 animals and the findings are reported in a separate paper (2).

RESULTS

Blood pressure determinations arranged according to age, sex, and body weight are given in table 1. Except for a single instance readings in rats under 600 days old were below 141 mm. (fig. 1). On this basis the upper limit of normotensive pressure was fixed at 140 mm. Normotensive levels did not change with advancing age (table 1). Frequency distribution curves of normotensive values with means close to 120 mm. were similar in animals under and over 600 days old (fig. 2). Considering the relatively small numbers involved, they fit fairly well into normal curves. Mean values for male rats ranged from 116 mm. to 128 mm. At corresponding ages readings were lower in females and ranged between 114 mm. and 120 mm. Magnitude of standard deviation reflected both the degree of physiologic variability and technical error inherent in the experimental conditions.

Hypertension was present in 31 per cent of males 677 days old and over, and in 19 per cent of females at similar ages (table 1). Mean hypertensive values were about the same in both sexes. Incidence of hypertension increased progressively with advancing age except in the oldest male rats. Highest frequency was in males at 850 days (46 per

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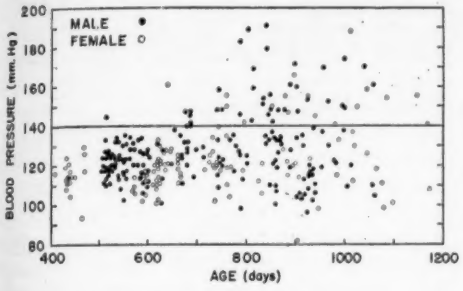

Fig. 1. Scattergram of blood pressures.

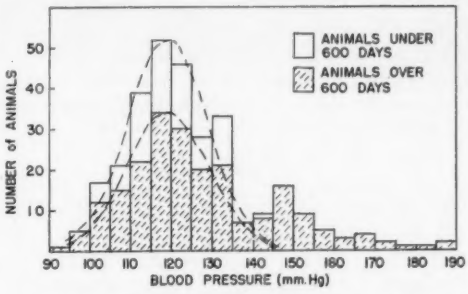

Fig. 2. Frequency distribution curves of normotensive blood pressures and incidence of hypertension.

TABLE 1. AGE AND BLOOD PRESSURE IN RATS.

No. of Blood Pressure Determinations	Mean Age of Rats (Days)	Mean Body Wt. (Gm.)	Blood Pressure (Mm. Hg)				
			Normotensive (under 141 Mm.)		Hypertensive (141 Mm. and over)		
			No.	Mean	No.	Mean	Incidence Percentage
Males							
18	219	383	18	122 ± 10.6*	0		
36	528	479(32)	35	120 ± 7.0	1	144	
36	582	470(21)	36	121 ± 9.3	0		
18	677	458	14	128 ± 9.1	4	145	22
24	762	423	18	125 ± 9.9	6	156	25
37	850	392(35)	20	125 ± 9.7	17	160	46
34	937	331(32)	26	116 ± 11.2	8	159	24
203					35†	157 ± 13.6	31
Females							
9	338		9	114 ± 9.4	0		
17	442	250(14)	17	115 ± 8.5	0		
10	583	274	10	110 ± 5.1	0		
30	633	264	29	118 ± 7.7	1	161	
23	747	263(19)	20	120 ± 9.1	3	149	13
12	869	241(9)	8	118 ± 6.8	4	155	33
24	1022	220(21)	15	114 ± 15.2	9	154	38
125					17†	154 ± 11.3	19

*Standard deviation.
†Hypertensive rats over 600 days old.
Figures in parentheses indicate number of rats used for calculation of the respective mean values.

TABLE 2. HEART WEIGHT AND BLOOD PRESSURE.

No. of Rats	Mean Age (Days)	Mean Blood Pressure (Mm. Hg)	Mean Body Wt. (Gm.)	Mean Heart Wt. (Gm.)	Mean Heart Wt. / Body Wt. Percentage
		Males			
18	219	122 ± 10.6*	383	1.12 ± .08	.29 ± .01
24	557	119 ± 7.6	485	1.54 ± .18	.32 ± .05
41	903	119 ± 12.0	358	1.60 ± .30	.45 ± .10
23†		161 ± 13.8	363	1.64 ± .26	.47 ± .12
		Females			
24	501	113 ± 7.6	260	1.08 ± .12	.40 ± .05
17	990	112 ± 13.5	229	1.20 ± .26	.52 ± .09
9†		154 ± 16.9	220	1.32 ± .31	.60 ± .09

*Standard deviation.
†Hypertensive rats.

cent) and in females at 1022 days (38 per cent). Distribution of hypertensive values is shown in figures 1 and 2.

Data on heart size in relation to age and blood pressure (table 2) revealed no significant difference between actual cardiac weights in normotensive and hypertensive males at 903 days compared with weights at 557 days; the same was true of females at 990 days and 501 days. However, relative to body weight, heart size did increase in older animals of both sexes. The ratio of $\frac{\text{body weight}}{\text{heart weight}}$ rose from 0.32 per cent to 0.45 per cent in normotensive males and from 0.40 per cent to 0.52 per cent in normotensive females. The higher percentages in females as compared with males were statistically significant. In male hypertensives the ratio remained essentially the same, but in females it increased from 0.52 per cent to 0.60 per cent, a statistically significant increment. Decreasing body weights in older animals led to higher ratios. Due to disease there was more variability in senescent rats and this was reflected by greater standard deviations. Differences between means of actual heart weights, and $\frac{\text{heart weight}}{\text{body weight}}$ ratios were statistically significant at the 3 per cent level.

DISCUSSION

The incidence of hypertension herein reported is probably lower than the actual frequency because of the limited number of observations and spontaneous fluctuations in blood pressure which are characteristic of the hypertensive state. In some rats only a single series of readings was made and in others determinations were made at relatively long intervals.

Certain conditions (1) that develop in aging rats are possible factors responsible for higher levels of blood pressure. Renal disease in the form of chronic nephrosis and glomerulonephritis is the most probable cause (although the same degree of renal pathology is found in normotensive as well as in hypertensive animals). All of the hypertensive rats had diseased kidneys except 2 females. Le-

sions appear earlier and are more severe in males than in females. In 13 male rats examined at 521 days the kidneys of 10 showed early changes. Moderate to marked alterations were present in all of the males belonging to the 850 day and 937 day old groups. In contrast, only 1 out of 10 females 583 days old had an early renal lesion. At 869 days and at 1022 days the kidneys of more than half of the 82 female rats were normal or showed minimal abnormalities. The remainder had moderately severe renal disease. Both incidence of renal disease and hypertension increase with advancing age.

Another common condition to be considered with respect to hypertension is periarteritis. However, the lesions occur chiefly in the pancreatic and mesenteric vessels and the renal arteries are rarely involved. A considerable number of spontaneous tumors develop in the strain of rat used for this study and among them are 2 neoplasms sometimes associated with hypertension, viz., pheochromocytoma of the adrenal medulla and adenoma of the anterior pituitary. At present nothing is known about the functional activity of these tumors in the rat.

In addition to hypertension, changes in the myocardium and aorta may also contribute to cardiac enlargement, particularly left ventricular dilatation and hypertrophy. In senescent rats degeneration and fibrosis are seen frequently in the heart muscle. Alterations in the aorta consist of widening of the lumen, thickening and inelasticity of the wall, and in many instances dilatation of the arch to aneurysmal size. Arteriosclerosis and medial calcification of the arterial system are found to a slight or moderate degree in less than 1 per cent of these animals. Hence, in this species there can be no possibility that the hypertension is related to arteriosclerosis.

SUMMARY

Normotensive levels of blood pressure in aging rats were essentially the same as in younger animals and were slightly higher in males than in females. Incidence of hypertension was greater in males than in females and increased with advancing age. The same was true of renal disease which was the most probable cause for the hypertension.

Heart weight in relation to body weight increased with advancing age and the ratios at different ages were higher in females than in males. Heart size was greater in hypertensive than in normotensive females but not in males.

REFERENCES

1. Berg, B. N., Lester, J., and Simms, H. S.: Diseases of Old Rats. (Abstract). *J. Gerontol.*, *7*:473, 1952.
2. Berg, B. N.: The Electrocardiogram in Aging Rats. *J. Gerontol.*, *10:* 420-423, 1955.
3. Berg, B. N.: Unpublished observations.
4. Kersten, H., Brosene, W. G., Ablondi, F., and SubbaRow, Y.: A New Method for the Indirect Measurement of Blood Pressure in the Rat. *J. Lab. & Clin. Med.*, *32:* 1090-1098, 1947.
5. Zucker, L., Hall, L., Young, M., and Zucker, T. F.: Quantitative Formulation of Rat Growth. *Growth*, *5:* 415-436, 1941.

THE ELECTROCARDIOGRAM IN AGING RATS*

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IN A PREVIOUS paper (2) the blood pressure and heart size in aging rats were reported. The present study deals with the electrocardiographic findings in these animals.

MATERIAL AND METHODS

Electrocardiograms were obtained in 144 rats, 97 males and 47 females. Ages and weights are recorded in tables 1 and 2. Diet, growth, and laboratory conditions were described previously (2).

After making preliminary blood pressure readings (2) the rat was put under light anesthesia by injecting intraperitoneally a solution containing 3 mg. nembutal per 100 Gm. rat weight. With the animal on its back, the legs were tied to a board and ribbon type copper electrodes shaped to hold the paws snugly were applied for 3 limb lead recordings. These electrodes were soldered to 15 cm. long plastic covered #23 copper wires which were attached to alligator clamps connecting with the terminals of an electrocardiograph of the type described by Rappaport and Rappaport (4) for use in small animals. It was a photographic string machine having an extremely taut string and amplifier, and a deflection speed of about 0.0015 second. Immediately after electrocardiography the rat was killed by the intraperitoneal injection of 50 mg. nembutal and a complete autopsy was performed. The heart and other organs were weighed. Tissues were fixed in Zenker's fluid and sections were stained with hematoxylin and eosin.

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RESULTS

The electrocardiogram in the rat was essentially the same as in man except for certain features that were modified by the faster heart beat. At corresponding ages the rate was more rapid in the male than in the female (table 2). At 557 days the rate in males was 376 while in females 583 days old the heart beat was 341. In all 3 leads the normal electrocardiogram (fig. 1) showed a positive P wave, a QRS complex represented by a positive R wave or occasionally by R and S waves of about the same amplitude, and a positive T wave. Lead 1 had a very low amplitude or was isoelectric except for the QRS complex. Lead 2 had the greatest amplitude and lead 3 was intermediate. Mean durations of the P-R, QRS and Q-T intervals were 0.05 sec., 0.01 sec., and 0.09 sec., respectively. Mean amplitude of R in lead 1 was 2.2 mm. The S-T segment and the T wave could not be measured because the latter overlapped the QRS complex and often came off the terminal portion of the R wave before it reached the isoelectric line. All measurements were practically the same in both sexes.

With advancing age the following changes occurred in the electrocardiogram. The heart rate decreased in males from a maximum of 376 to 310, and in females from an upper limit of 341 to 283 (table 2). There was no change in the P wave. The slower heart rate was reflected in lengthening of the P-R interval from 0.05 sec. to 0.06 sec. and 0.07 sec., and in prolongation of the QRS complex from 0.01 sec. to 0.02 sec. and 0.03 sec. Mean amplitude of R in lead I was 3.4 mm. Satisfactory measurements of the Q-T interval were too few to be significant.

Left axis deviation (fig. 2) occurred in nearly 60 per cent of all rats over 800 days old, the incidence being higher in females (72 per cent) than in males (56 per cent). Other abnormalities in the electrocardiogram

TABLE 1. HEART WEIGHT AND LEFT AXIS DEVIATION.

No. of Rats	Mean Age (Days)	Mean Body Wt. (Gm.)	Mean Heart Wt. (Gm.)	Mean Heart Wt. / Body Wt. Percentage	No.	Hypertension (141 Mm. Hg or Over) Percentage	No.	Left Axis Deviation Percentage
				Males				
18	219	383	1.12 ± .08*	.29 ± .01	0		0	
24	557	485	1.54 ± .18	.32 ± .05	0		0	
32	849	389	1.62 ± .24	.42 ± .10	16		16	
23	950	351	1.66 ± .32	.48 ± .12	4		15	
					20†	36	31	56
				Females				
14	440	250	1.11 ± .14	.42 ± .05	0		0	
10	583	274	1.03 ± .07	.38 ± .02	0		0	
9	889	243	1.27 ± .31	.53 ± .11	2		7	
9	1085	215	1.10 ± .25	.51 ± .10	6		6	
					8†	44	13	72

*Standard deviation.
†Hypertensive rats over 800 days old.

TABLE 2. ELECTROCARDIOGRAM IN RATS.

No. of Rats	Mean Age (Days)	Heart Rate		P-R (Sec.)		QRS (Sec.)		Q-T (Sec.)		No. with Left Axis Deviation
		Mean	Range	Mean	Range	Mean	Range	Mean	Range	
					Males					
18	219	353	300–415	0.05	0.04–0.06	0.01	0.01–0.02	0.08	0.06–0.09	0
24	557	376	300–480	0.05	0.05–0.06	0.01	0.01–0.02	0.09	0.08–0.10	0
32	851	322	167–438	0.06	0.05–0.10	0.02	0.01–0.04			16
23	951	310	230–430	0.07	0.06–0.10	0.03	0.01–0.04			15
					Females					
17	442	324	252–420	0.05	0.04–0.07	0.01	0.01–0.02	0.09	0.08–0.12	0
10	583	341	258–420	0.05	0.05–0.06	0.01	0.01–0.02	0.09	0.08–0.10	0
11	893	307	234–410	0.06	0.05–0.09	0.02	0.01–0.03			7
9	1085	283	222–375	0.07	0.05–0.08	0.02	0.01–0.03			6

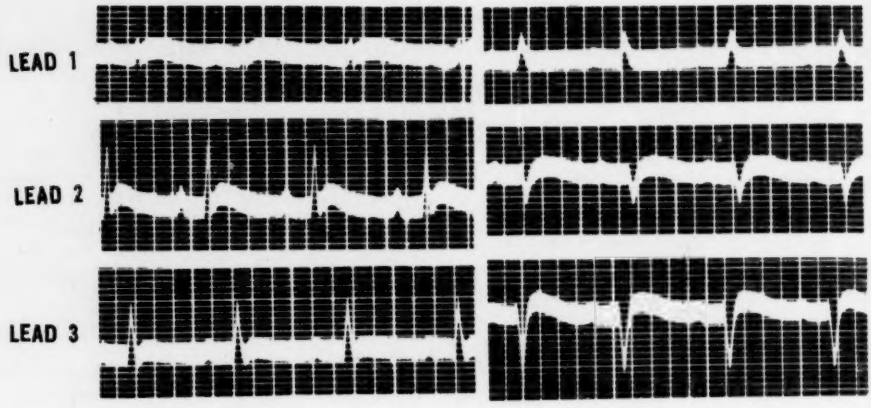

FIG. 1. Normal electrocardiogram. Female rat, 569 days old.

FIG. 2. Left axis deviation. Male rat, 915 days old.

observed occasionally were: sinus arrhythmia, sinus bradycardia, premature beats, partial a-v block, and right axis deviation.

Since left axis deviation is usually produced by left ventricular hypertrophy and dilatation, the heart weights of rats at different ages were compared with reference to the electrical axis (table 1). The findings relative to blood pressure and heart size were essentially the same as those reported previously (2). In terms of actual heart weight there was no correspondence with left axis deviation. In males there was no significant difference in heart size, between rats 557 days old and rats over 800 days old, yet the electrical axis in the former was normal while it was shifted to the left in 56 per cent of older animals. Also, the electrocardiogram in half of the 849 day old males showed left axis deviation though the heart weight in these animals (1.63 Gm.) did not differ significantly from the heart weight of the other half (1.59 Gm.) with a normal electrical axis. In females too, actual heart size was essentially the same at different ages but left axis deviation existed only in those over 800 days old (72 per cent).

In relation to body weight the heart was significantly larger in old rats as compared with younger ones (table 1). Hypertension was present in 36 per cent of males and in 44 per cent of females over 800 days old. However, there was no parallelism between elevated blood pressure, $\frac{\text{heart weight}}{\text{body weight}}$ ratio, and left axis deviation.

DISCUSSION

Inasmuch as the absolute weight of the heart did not increase significantly with advancing age, left axis deviation cannot be attributed to actual cardiac enlargement. Relative to body weight, however, heart size was greater in older animals, a higher ratio resulting from body weight loss due to disease (1). On the basis of malnutrition it is possible that the position of the heart was altered so that rotation occurred with a concomitant shift of the electrical axis to the left. Slowing of the heart rate was also attributable to malnutrition.

Left ventricular strain due to changes in the cardiovascular system of aging rats may also contribute to left axis deviation. Frequent findings in the hearts of senescent animals, particularly in the left ventricle, were degeneration and fibrosis of the myocardium. In the aorta there was thickening and inelasticity of the wall, widening of the lumen and dilatation of the arch, often to aneurysmal proportions. It is of interest to note that in humans left axis deviation is the most common alteration in the electrocardiograms of later life (3).

SUMMARY

The normal electrocardiogram in the adult rat is described. With aging the following changes occur: slowing of the heart rate, increase in duration of the P-R and QRS intervals, and left axis deviation.

REFERENCES

1. Berg, B. N., Lester, J., and Simms, H. S.: Diseases of Old Rats (Abstract). *J. Gerontol.*, *7:* 473, 1952.
2. Berg, B. N., and Harmison, C. R.: Blood Pressure and Heart Size in Aging Rats. *J. Gerontol.*, *10:* 416-419, 1955.
3. McNamara, R. J.: A Study of the Electrocardiogram in Persons over 70. *Geriatrics*, *4:* 150-160, 1949.
4. Rappaport, M. B., and Rappaport, I.: Electrocardiographic Considerations in Small Animal Investigations. *Am. Heart J.*, *26:* 662-680, 1943.

ALTERATIONS IN DARK ADAPTATION AS A FUNCTION OF AGE*

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Everyone is familiar with the ability to see more clearly after varying periods of time in the darkness. This phenomenon is known as dark adaptation. Those who adapt very poorly almost always experience difficulty in seeing at night. Considerable variation exists among individuals, however, and even within the same individual from time to time. Preexposure to light, the size and color of the test stimulus, and the retinal area stimulated are variables which influence this function. Night vision is impaired by many factors, such as vitamin A deficiency, long exposure to bright sunlight, oxygen want, and level of blood sugar. It is also well known that visual acuity decreases under low illumination.

Dark adaptation proceeds in two stages. The first is very rapid and is over in a few minutes while the second begins after 6 or 8 minutes and goes on for half an hour or more. There is sufficient evidence to believe that the rapid first adaptation represents the behavior of the cones of the retina (color vision) and the delayed or slower second stage of adaptation, the behavior of the rods (night vision).

Vision is considered to be dependent on the presence of certain light-sensitive pigments in the rods and cones. The pigment of the rods has been identified. It is called "visual purple" and is believed to be derived from vitamin A. The visual pigments when exposed to light go through a continuous cycle of destruction and regeneration. Visual purple is more rapidly destroyed by bright light than are the pigments of the cones. For this reason, the cones are more sensitive to light during the first few minutes after exposure to bright light. As the visual purple regenerates, the rods become more sensitive. They can reach a sensitivity about 1,000 to 10,000 times greater than that of the cones (5, 18).

There are various physiologic factors which are known to influence one's ability to see at night. In addition to a deficiency in vitamin A, low levels of blood sugar and reduced amounts of oxygen impair vision at low illumination (9, 12, 13, 14). Carbon monoxide, alcohol, and other substances known to reduce the amount of oxygen reaching the tissues have also been found to have an adverse influence (8, 10, 15, 16). Since it is believed that there are changes in cerebral circulation and the oxygen transport system with increasing age, it might be expected that one would find changes in dark adaptation in older people. It is the purpose of this paper to explore further the experimental evidence and the theoretic implications of this function in aging.

In previous studies one of us has described the effects on differential brightness sensitivity of 1) oxygen deprivation, 2) insulin hypoglycemia, and 3) carbon monoxide (12-15). The effects of altitude, i.e., oxygen want, are shown in figure 1. Under conditions equivalent to an altitude of only 7,000 feet, the change in visual sensitivity was significant (7).

The concentration of blood sugar is intimately related to the functioning of the central nervous system. This is true because glucose is practically the only substance which can be utilized as a fuel for its metabolism. If the supply is deficient, the oxidation processes are slowed, and the effect should be equivalent to that of a reduced supply of oxygen. The retina behaves very much like the central nervous system in regard to its metabolism. The effects on visual sensitivity were significant when the concentrations of blood sugar dropped following the injection of insulin to about 65 to 70 mg. and were comparable to those produced by low oxygen. Figure 2 illustrates these findings (13). In regard to carbon monoxide, even the small quantities which may result from the inhalation of three cigarettes were found to influence the dark adaptation function adversely (15).

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The statistical computations in this study were made by Professor P. J. Rulon, Harvard School of Education.

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†On leave of absence from Fresno State College, Fresno, California, during 1953-1954.

METHODS OF MEASUREMENT

Some of the tests devised to measure night vision provide a simple estimate of the minimal perceptible intensity of light; others measure the minimum intensity of light required to locate an object; still others require not only location of the test object, but also discrimination of its form as well. In this study the Hecht-Schlaer adaptometer was used. This instrument, which measures minimum perceptible intensities of light, is the most reliable for determining an individual's capacity for dark adaptation (6).

The measurements were carried out as follows: Each subject was connected with the apparatus by a pair of goggles, which blocked off the left eye so that only the right eye was exposed to the bleaching light and to the stimuli which followed. The head was held in place with an adjustable chin-rest to assure the proper use of the artificial pupil (3 mm. in size). A light of about 1,500 millilamberts was exposed for three minutes. This light was bright enough to involve both cone and rod adaptation separately and adequately and the exposure long enough to produce the main effect without boring the subject. Following the initial threshold which was made immediately after the exposure of the bright light, additional thresholds were taken about every 2 minutes for 10 minutes and then approximately every 3 minutes until the end of the session, i.e., for 30 minutes. The intensity of the stimulus was controlled by an optical wedge. The subject's task was very simple and involved reporting whether or not he saw a flash of light.

When the results are plotted, the various points on the dark adaptation curves represent single measurements of light sensitivity (thresholds) in relation to the intensities a subject could just barely see as he remained in the dark. Time is plotted on the horizontal axis on an ordinary linear scale. The light sensitivity, however, is plotted on the vertical axis on a logarithmic scale in terms of micromicrolamberts (6). On such a scale, 1 means 10 units, 2 means 100 units, 3 means 1,000 units, and so on. With a logarithmic scale, therefore, a large range of intensities can be easily plotted which would otherwise extend over enormous areas. Figures 1 and 2 illustrate these points.

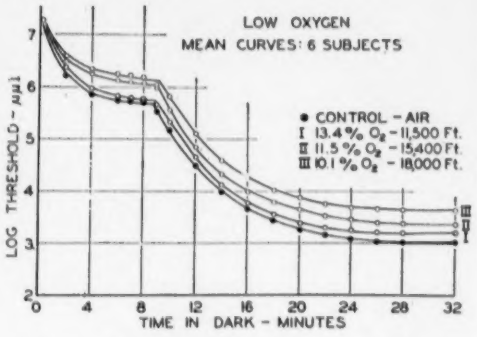
LOW OXYGEN
MEAN CURVES: 6 SUBJECTS
• CONTROL – AIR
I 13.4 % O2 – 11,500 Ft.
II 11.5 % O2 – 15,400 Ft.
III 10.1 % O2 – 18,000 Ft.
LOG THRESHOLD – μμl
TIME IN DARK – MINUTES

Fig. 1. The effect of oxygen want on dark adaptation. (From McFarland and Forbes, 10)

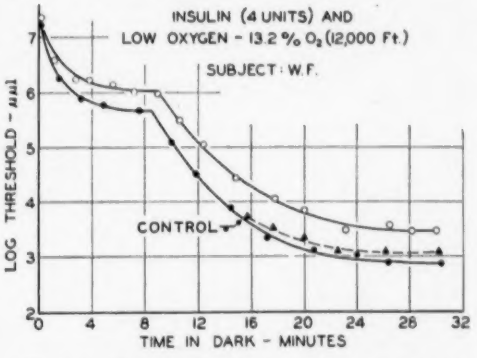

Fig. 2. The effect of low blood sugar on dark adaptation (open circles), and the recovery of sensitivity with glucose (triangles). (From McFarland and Forbes, 10).

Experimental Subjects—In this study 201 males between the ages of 20 and 60 years were tested by means of the Hecht-Shlaer adaptometer described above. All of the measurements were made by the same experimenter (R.M.) and the tests were given in the morning at the same time and at similar intervals following meals. An artificial pupil was used to control the change in pupil size which is known to vary with age.

RESULTS

The results obtained on an initial group of 188 subjects varying in age from 20 to 47 years are shown in table 1 (11). The mean curves for each age group have been plotted in figure 3.

It is interesting to note that the difference between the mean final log reading for Group

I (age 20-24 yrs.) and Group V (40-47 yrs.) is 0.40 of a log unit. This represents an increase in the intensity of illumination required by the 40-47 year age group of about 150 per cent. The changes with age are quite large in this function. For example, critical ratios between the means of 5 age groups were found to increase from 3.3 between the 20-24 year and 25-29 year age groups to 12.9 between the 20-24 year and 40-47 year age groups.

TABLE 1. NIGHT VISION IN RELATION TO AGE.

	N	Final Log Setting	
		Mean	S.D.
Group I (20-24 yrs.).....	12	2.75	0.06
Group II (25-29 yrs.).....	55	2.82	0.08
Group III (30-34 yrs.)....	71	2.87	0.09
Group IV (35-39 yrs.)....	26	3.02	0.09
Group V (40-47 yrs.).....	24	3.15	0.12
Total Group.....	188	2.92	0.09

The next step in the experiment was to extend the study to include more subjects in the lower and higher age ranges, especially below 24 and above 47. After the threshold determinations were made for these subjects a more elaborate statistical analysis was carried out on the data to determine 1) whether the differences in final level reached would increase in a still older age group, 2) whether the rate of adaptation was related to age, and 3) whether the transition time from cone to rod vision is more protracted with increasing age. The results on the first two points are presented below.

Figure 4 shows the dark adaptation curve for a typical subject. The type of curve shown is called inverse logarithmic, and is known as the die-away, or decay curve. It is the kind of curve that radio-active elements exhibit in losing their radioactivity. The general equation of the curve is $y = 10^{a+bx} + C$. For our purposes, this becomes $L = 10^{a+bt} + C$ where L is $\log_{10}\mu\mu$ L and t is measured in minutes. In these terms, C represents the final point of dark adaptation; our interest is

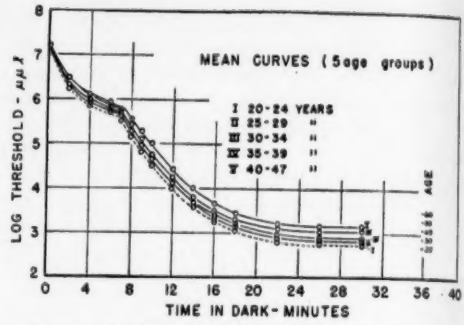

Fig. 3. Night vision in relation to age; mean dark adaptation curves for five age groups. (From McFarland and associates, 11).

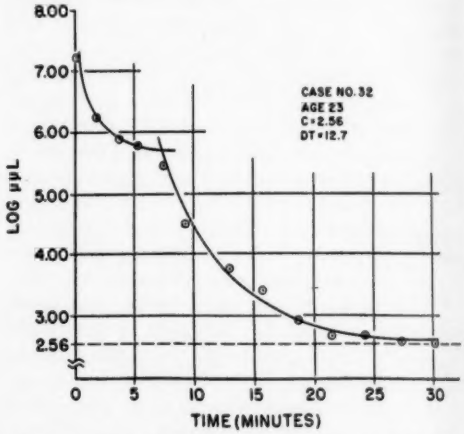

Fig. 4. The dark adaptation curve for an individual subject, showing the computed final level of adaptation (C).

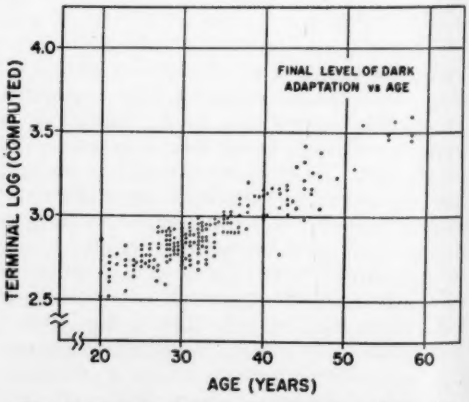

Fig. 5. Scatter diagram showing the relationship between age and final level of dark adaptation.

also in something which can be related to b, which is concerned with rate.

C is the value the curve is approaching, or dying away toward. In figure 4, C is 2.56. By the end of 30 minutes in the dark, the subject was still improving slightly, and the 2.56 is computed to be his end-point, or the value he would eventually reach if he continued in darkness for much longer time.

This terminal value, C, was computed for each of the 201 subjects, using the standard graphic method as described by Davis (4). Figure 5 gives the resulting scatter plot, with C on the vertical axis and age along the horizontal. A striking relationship is shown between the final level of adaptation and age. Seven subjects discovered to be deficient in vitamin A were excluded. The correlation between C and age for the 194 cases remaining was calculated to be 0.895, an unusually high correlation. The average final level of adaptation is related to age by the following equation: $C = 2.615 + 0.023\ (\text{Age} - 20)$. The average for 20 year olds is 2.615, and for every year above 20, the value increases by 0.023. Thus in 13 years, C increases by 0.3. Three-tenths of a log unit corresponds to a multiple of 2, so for every increase of 13 years in age, intensity of illumination must be doubled to be just seen by the fully dark adapted eye.

The question may now be raised of the rate at which the subjects adapted. Determining the rate of adaptation is difficult because readings during the period of transition from cone to rod vision may pertain to either system. The question of rate has hence been approached through a consideration of how fast the adaptation curve drops toward the final threshold level. In this connection "Drop Time" is used as the measure with reference to figure 4, as follows: At the end of 30 minutes, the subject, with a reading of 2.61, was 0.05 above his computed terminal point, 2.56. He had reached a point 0.5 above the terminal value 12.7 minutes earlier. That is, during these 12.7 minutes his adaptation had progressed to a point which was only 1/10th as far above his terminal point. A short Drop Time thus means a fast rate of adaptation, because the subject is more rapidly reducing his distance above his terminal point.

Drop Times were computed for the 194 normal subjects and the linear correlation with age was calculated at −0.137. However, both older and younger subjects showed longer Drop Times than did those in the intermediate age range, and with this evidence of curvilinearity, the correlation calculated has little meaning. The average Drop Times by age groups are given in table 2.

TABLE 2. MEAN DROP TIME IN RELATION TO AGE.

Age	Mean Drop Time (Minutes)
50–59	11.08
40–49	10.44
30–39	10.69
20–29	11.15

DISCUSSION

Similar results have been reported by Hecht and Mendelbaum (5), who used the same apparatus. In both this study and ours, the size of the pupil was controlled with a 3-mm. pupillometer. The variation in dark adaptation with age, as measured by the final rod threshold attained, was also studied in a group of 758 English factory workers, ranging in age from 14 to 74 yrs. The marked differences observed in maximum light thresholds in relation to age were attributed to the diminished pupil size in the elderly subjects (17). In a study of 222 subjects ranging from 20 to 89 yrs of age, Birren (3) found significant reductions in pupil size with age in both light and dark conditions.

Significant changes with age in the light threshold of the dark-adapted eye have been reported by Birren, Bick, and Fox (1) in 130 subjects ranging from 18 to 83 years of age. The Hecht-Shlaer adaptometer was used, and the pupils of all subjects over 40 years of age were dilated with a mydriatic. A significant decline in sensitivity of the dark-adapted eye was noted as age increased. This decline was most marked in subjects beyond the age of 60.

Measurements of the rate and level of dark adaptation were made by Birren and Shock (2) on 91 subjects aged 40 to 83 years, using the same apparatus. Although no correlation was found between age and rate of dark adaptation, there was a significant decrease in the final level of adaptation in the older subjects. The results of this study were similar to those obtained by us for subjects of comparable age.

According to concepts presented here, the underlying basis of the physiologic changes in older subjects related to an interference of normal metabolic processes within individual nerve cells of the brain and retina. This interference may operate through a reduced rate of transference of essential substances to the metabolizing cells required for normal metabolic processes. Transference may be inadequate because of reduced supply, reduced circulatory delivery, or slower diffusion. The amount of essential substances which reach the cells may be reduced because of greater distances over which diffusion must take place, reduced permeability, or the presence of inert substances through which nutrients diffuse with difficulty (7).

SUMMARY

The conclusions to be drawn from this study are as follows:

1. There is a consistent decline in ability to see at low levels of illumination with increasing age under the conditions of this experiment.

2. The final level of dark adaptation is clearly a function of age. The linear correlation between age and final threshold level is actually so high it may be used to "predict" age within narrow limits of error ($r = 0.89$). Rate of adaptation may have a curvilinear relationship to age since it is slower both for younger and older ages than for the intermediate range.

3. The limitation in ability for dark adaptation is quite marked in older subjects and is believed to be related to certain basic physiologic functions in the nerve cells of the brain and retina.

4. These findings are of practical significance in helping to explain the difficulties experienced by subjects over 55 to 60 years of age in driving or flying at night. Serious questions of safety may be raised if the amount of available light is further reduced for older persons through the use of tinted windshields or colored glasses.

REFERENCES

1. Birren, J. E., Bick, M. W., and Fox, C.: Age Changes in the Light Threshold of the Dark Adapted Eye. *J. Gerontol., 3:* 267-271, 1948.
2. Birren, J. E., and Shock, N. W.: Age Changes in Rate and Level of Visual Dark Adaptation. *J. Appl. Physiol., 2:* 407-411, 1950.
3. Birren, J. E., Casperson, R. C., and Botwinick, J.: Age Changes in Pupil Size. *J. Gerontol., 5:* 216-221, 1950.
4. Davis, D. S.: *Empirical Equations and Nomography,* McGraw-Hill, New York, 1943.
5. Hecht, S., and Mandelbaum, J.: The Relation Between Vitamin A and Dark Adaptation. *J.A.M.A., 112:* 1910-1916, 1939. See also Mandelbaum, J. Dark Adaptation. *Arch. Ophth. 26:* 203-239, 1941.
6. Hecht, S., and Shlaer, S.: An Adaptometer for Measuring Human Dark Adaptation. *J. Optic. Soc. Amer., 28:* 269-275, 1938.
7. McFarland, R. A.: Anoxia: Its Effects on the Physiology and Biochemistry of the Brain and on Behavior. Ch. 22, in: *The Biology of Mental Health and Disease,* Report of the 27th Annual Conference of the Milbank Memorial Fund, Paul Hoeber, Inc., N.Y., 1952.
8. McFarland, R. A., and Barach, A. L.: The Relationship Between Alcoholic Intoxication and Anoxemia. *Am. J. Med. Sci., 192:* 186-198, 1936.
9. McFarland, R. A., Evans, J. N., and Halperin, M. D.: Opthalmic Aspects of Acute Oxygen Deficiency. *Arch. Ophth., 26:* 886-913, 1941.
10. McFarland, R. A., and Forbes, W. F.: The Effects of Variations in the Concentration of Oxygen and of Glucose on Dark Adaptation. *J. Gen. Physiol., 24:* 69-98, 1940.
11. McFarland, R. A., Graybiel, A., Liljencrantz, E., and Tuttle, A. D.: An Analysis of the Physiological and Psychological Characteristics of Two Hundred Civil Air Line Pilots. *J. Aviation Med., 10:* 2-52, 1939.
12. McFarland, R. A., Halperin, M. H., and Niven, J. I.: Visual Thresholds as an Index of Physiological Imbalance During Anoxia. *Am. J. Physiol., 142:* 328-349, 1944.
13. McFarland, R. A., Halperin, M. H., and Niven, J. I.: Visual Thresholds as an Index of Physiological Imbalance During Insulin Hypoglycemia, *Am. J. Physiol., 145:* 299-313, 1946.
14. McFarland, R. A., Halperin, M. H. and Niven, J. I.: Visual Thresholds as an Index of the Modification of the Effect of Anoxia by Glucose. *Am. J. Physiol., 144:* 378-388, 1945.
15. McFarland, R. A., Roughton, F.J.W., Halperin, M. H. and Niven, J. I.: The Effects of Carbon Monoxide and Altitude on Visual Thresholds. *J. Aviation Med., 15:* 381-394, 1944.
16. Newman, H. W.: The Effect of Altitude on Alcohol Tolerance. *Quart. J. Stud. on Alcohol, 10:* 398-404, 1949.
17. Robertson, G. W., and Yudkin, J.: Effect of Age upon Dark Adaptation. *J. Physiol., 103:* 1-8, 1944.
18. Wald, G.: Vitamin A in Eye Tissues. *J. Gen. Physiol., 18:* 905-915, 1935.

AGE DIFFERENCES IN FINGER, JAW, AND FOOT REACTION TIME TO AUDITORY STIMULI*

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Simple reactions of humans slow with advancing age (1, 3, 4, 7, 9, 11, 15). There is little evidence, however, which suggests where the delay in response latency occurs. Because slowing of responses is such a general characteristic of aging it seems most desirable to attempt to define and localize the processes involved. If age changes in the peripheral pathways were primarily involved then it would be expected that the reaction time of the foot with its long pathways would be disproportionately slow compared, e.g., with the finger or jaw. If in contrast, the delay were of a constant size for all three reactions then another explanation would have to be sought to account for the delay. The third possible result would be that age differences were found between the finger, jaw, and foot which were variable but independent of path length.

METHODS

Simple auditory reaction time was measured using a 1000 cycle tone as a stimulus presented through ear phones (12). Each stimulus was 0.20 sec. duration and was preceded by a visual warning or ready signal. The interval between the ready signal and the stimulus was randomized between 1 and 6 seconds. Interval timers were used to control the ready light, delay interval, and stimulus duration. Instruction trials were given using the separate reaction keys for the finger, jaw, and foot. Micro-switches were used as response keys and minimum movement broke the chronoscope circuit. The chronoscope was driven with a synchronous motor and was read to 0.01 sec.

Each subject had a total of 150 responses distributed as 25 each for the following order: finger, foot, jaw, foot, jaw, and finger. For each subject a median reaction time was determined for finger, jaw, and foot reaction times. The respective split-half reliabilities were 0.92, 0.96, and 0.94, N's = 45, 44, and 45. The median value rather than the arithmetic mean was used as the measure of central tendency because of the skewing which occurs in the distribution of individual measurements.

All subjects were white male. There were 32 young subjects between the ages of 18 and 36 years, and 32 elderly subjects between the ages of 61 and 91 years. The latter group consisted of 18 subjects who were full time employees of the Public Health Service, 9 subjects who were retired independent members of the community, and 5 subjects who were residents of a religious home for the aged. The young subjects consisted of 24 who were full time employees of the Public Health Service and 8 who were religious research volunteers.

RESULTS

The elderly subjects were significantly slower than the young subjects for the finger, foot, and jaw reaction times (table 1). The age differences were 27, 21, and 29 per cent, respectively, for finger, jaw, and foot.

In contrast to the statistically significant age differences in reaction time, no difference was found between the young and elderly which increased with the length of the path of the peripheral nervous system. Thus, for example, when the two age groups were compared for the difference in finger and foot reaction time, there was only a slightly larger difference for the elderly group, which would be in the direction of the hypothesis that greater time is required in peripheral conduction. The difference, however, was not statistically significant (table 1).

The results indicate that the increment in reaction time for the elderly group is a constant. With the present methods, the constant increment in reaction time with advancing age

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TABLE 1. SIMPLE AUDITORY REACTION TIME OF THE FINGER, JAW, AND FOOT IN YOUNG AND ELDERLY SUBJECTS.

		A Finger	B Jaw	C Foot	A-B	C-B	C-A
Young 19–36 years N = 32	Mean*	.182	.194	.202	—.012	.008	.020
	σ	.033	.039	.034	.019	.024	.020
Elderly 61–91 years N = 32	Mean*	.232	.254	.260	—.022	.006	.028
	σ	.049	.055	.060	.041	.032	.044
Elderly —Young	Difference	.050	.060	.058	.010	.002	.008
	t	4.63	4.96	4.64	1.3 not signif.	.28 not signif.	.79 not signif.
	p	$<.01$	$<.01$	$<.01$			

*Mean of the individual median measurements, in seconds.

seems to hold both on a relative and on an absolute basis (fig. 1).

DISCUSSION

There were three possible results obtainable in this study: (a) that the age differences between the three forms of reaction would be of the same magnitude, (b) that the age differences would be a variable associated with the length of the peripheral path, and (c) that the differences would be a variable but independent of path length. The first result was obtained. There remains the issue whether the increment in reaction time with age is associated with an age change within the nervous system or in some peripheral factor common to all types of response, e.g., the myoneural junction, muscle contraction, or movement of bone joints.

There is evidence that excitability does not change with age (5) but this of course does not describe the time course of the response which is pertinent here. Delays associated with the motor synapse and neuromuscular junction are about 1 msec. which is very short in the present context (6). Thus, if these values would change by twofold with advanced age their total contribution to a reaction, such as moving a finger, would still

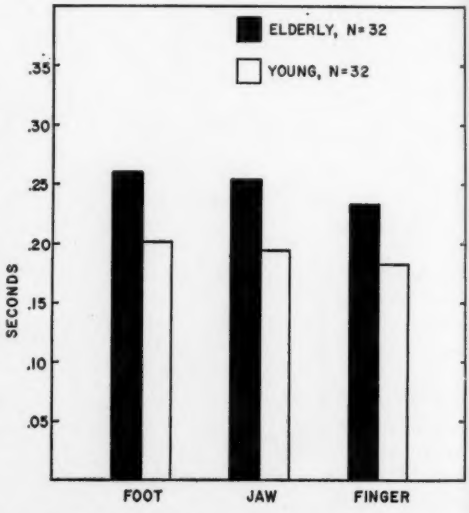

Fig. 1. Age differences in finger, jaw, and foot reaction time to auditory stimuli. The heights of the vertical bars represent the mean reaction time of the two age groups: young 19-36 years, and elderly 61-91 years. In each instance the age difference in mean reaction time is statistically significant, whereas the differences between the type of response, finger, jaw, and foot are not significant.

be small (see also 10, 13, 14). The age differences in reaction time in the present study were 50 to 60 msec.

There is little evidence about age changes in reflexes and muscle contraction. Kumnick has presented evidence that pupillary contraction is slower in advanced age groups but the time changes are small compared with the reaction time results (8). In response to light stimulation the mean pupil constriction rate for subjects over the age of 70 years was about 15 mm. per sec.; for subjects in the age range 18 to 28 years, the mean constriction rate was about 19 mm. per sec. There seemed to be no age difference in latency of the pupil constriction although this was not evaluated quantitatively. Maximum velocity of constriction was reached about 0.04 sec. in the young subjects and 0.05 sec. in the older subjects.

In addition to the fact that age changes in the neuromuscular processes are likely to be small relative to a voluntary reaction time, there is the issue that in the present study the movements of the finger, jaw, and foot required to effect a response were small. The response keys were such that the initial movement broke the chronoscope circuit so only a small portion of the total movement was necessary to effect the response, i.e., about 1 to 2 mm. It is to be noted that the reaction time of the jaw was longer than the reaction time of the finger. This finding is contrary to what might be expected because of the shorter conduction pathway for the jaw. This result may be explained in large part by the fact that the different modes of response involved microswitches with different mechanical arrangements. Slight differences in throw distances between response keys can contribute to the time measurements. While such factors influence the direct comparison of reaction times between modes of response, it has little relevance to a comparison of the age groups since the factors would be the same for both groups. The present study is primarily concerned with explaining the increase with age in reaction time. Within the limitations of existing information, it seems most plausible to regard the slowing of reaction time with advanced age as primarily a phenomenon of the central nervous system (2).

SUMMARY

1. Simple auditory reaction time was measured for the finger, jaw, and foot in young and elderly subjects. The purpose was to determine if the elderly subjects show a disproportionate slowing of foot responses compared with the finger and jaw as a test of the hypothesis that the slowing of reaction time with advancing age is correlated with path length of the peripheral nerves.

2. A 1000 cycle tone presented with ear phones was used as the stimulus. Each stimulus was preceded by a visual ready signal with a random delay of 1 to 6 sec. (interpolated between the ready signal and the stimulus.) A simple movement of the foot, finger, or jaw operated the appropriate key. Each subject gave a total of 150 individual responses, in the order of 25 each for finger, foot, jaw, foot, jaw, finger. For each subject a median reaction time was computed for finger, foot, and jaw. The corresponding standard errors of measurement for fifty trials were, 0.016, 0.012, and 0.015 seconds.

3. The reaction time of the elderly subjects was significantly slower than the young subjects but there was no relation to the length of the peripheral nerve path involved. The mean reaction times for the finger, jaw, and foot respectively for the young subjects ($N = 32$) were 0.182, 0.194, and 0.202. The corresponding values for the elderly subjects ($N = 32$) were 0.232, 0.254, and 0.260. Since the age differences between the reaction time means did not significantly increase for the foot as compared with the finger and jaw, it may be concluded that the age change in reaction time is not a variable associated with the length of the peripheral path. An examination of the present evidence suggests that it is plausible to regard the age changes in response latency as a property of the central nervous system.

REFERENCES

1. Bellis, C. J.: Reaction Time and Chronological Age. *Proc. Soc. Exper. Biol. & Med., 30:* 801-803, 1933.
2. Birren, J. E.: Age Changes in Speed of Simple Responses and Perception and Their Significance for Complex Behavior. *Old Age in the Modern World.* E. & S. Livingstone, London, 1955.
3. Birren, J. E., and Botwinick, J.: The Relation of Writing Speed to Age and to the Senile

Psychoses. *J. Consult. Psychol., 15:* 243-249, 1951.

4. Botwinick, J., and Shock, N. W.: Age Differences in Performance Decrement with Continuous Work. *J. Gerontol., 7:* 41-46, 1952.
5. Bourlière, F. Excitability and Aging. *J. Gerontol., 3:* 191-195, 1948.
6. Fulton, J. F.: *A Textbook of Physiology.* W. B. Saunders, Philadelphia 1955, Chap. 2, Gelfan, S., p. 123-158.
7. Goldfarb, W.: *An Investigation of Reaction Time in Older Adults.* Teachers College, Columbia University, Contributions to Education, No. 831, New York, 1941.
8. Kumnick, L. S.: Pupillary Psychosensory Restitution and Aging. *J. Optic. Soc. America, 44:* 735-741, 1954.
9. Miles, W. R.: Psychological Aspects of Aging. In: E. V. Cowdry, ed., *Problems of Aging.* Williams & Wilkins, Baltimore, 1942.
10. Norris, A. H., Shock, N. W., and Wagman, I. H.: Age Changes in the Maximum Conduction Velocity of Motor Fibers of Human Ulnar Nerves. *J. Appl. Physiol., 5:* 589-593, 1953.
11. Obrist, W. D.: Simple Auditory Reaction Time in Aged Adults. *J. Psychol., 35:* 259-266, 1953.
12. Seashore, R. H., and Seashore, S. H.: Individual Differences in Simple Auditory Reaction Times of Hands, Feet, and Jaws. *J. Exper. Psychol., 29:* 342-345, 1941.
13. Sommer, J.: Synchronisierung motorischer Impulse und ihre Bedeutung für die neurophysiologische Forschung. *Ztschr. f.d. ges. Neurol. u. Psychiat., 172:* 500-530, 1941.
14. Wagman, I. H., and Lesse, H.: Maximum Conduction Velocities of Motor Fibers of Ulnar Nerve in Human Subjects of Various Ages and Sizes. *J. Neurophysiol., 15:* 235-244, 1952.
15. Welford, A. T.: *Skill and Age.* Oxford University Press, London, 1951.

SPEED OF RESPONSE AS A FUNCTION OF PERCEPTUAL DIFFICULTY AND AGE*

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It has been pointed out that a possible factor in the slow responses of elderly individuals is perceptual difficulty (1, 2). Thus the hypothesis may be formulated that a large part of the increased response time with age lies in difficulty in perceiving the stimulus (8). A test of this hypothesis requires that the age differences in response time should be studied as a function of experimentally varied perceptual difficulty (6). Previous studies have reported results of response time in relation to difficulty using young adults as subjects. Henmon (5) described the use of judgments of differences in two line lengths; the subject was required to say which of two lines was the shortest, the right or left of a simultaneously present pair which were varied in the amount of difference in line length. As the differences between the lines become smaller, the response time becomes progressively longer. This method seems ideally suited to the present problem. If aged individuals have a perceptual deficit compared with young persons, then as the stimulus judgments become easier, the aged should become relatively faster in their response times. If in contrast the deficit is not a perceptual factor, then there would be a constant age difference between the response time to large and small difference in line lengths.

METHODS

Procedure: Forty eight cards, each with two vertical lines of unequal length were presented tachistoscopically, one card at a time. Viewing of the cards was binocular at a distance of two feet. The exposed area was approximately 7¾ in. wide and 7¼ in. high. The stimulus lines were vertical and were black on a white background. Each card had a standard line 15 mm. wide and 80 mm. long, and a variable line 15 mm. wide and shorter than the standard by 1, 2, 3, 4, 5, 7, 10, 15, 20, 30, 40, or 50 per cent. The difference between the standard line and the variable line was distributed equally at both ends of the shorter line, i.e., there was not a common base for the two lines. The lines were separated by 30 mm. horizontal distance. The 12 differences in line length were presented both on the right and left sides. Each difference was judged at least twice on the right and twice on the left side, position responses were thus equated.

Between judgments the subject viewed a cross with 25 mm. arms in the geometric center of the field. At 2.5 sec. prior to the stimulus, a warning buzzer was sounded for 0.5 sec., to fix the subject's attention upon the field. The subject was required to respond as quickly as he could when the stimulus lines were presented by saying "right" or "left" to indicate the side of the shorter line. The vocal response operated a voice key which interrupted the chronoscope circuit. The response latency of the subject was measured to the nearest 0.01 sec. The stimulus cards were presented for sufficient time to permit the subjects to make a judgment and to verbalize a response; the stimulus was never longer than 2 sec.

Each of the 12 differences in line lengths were judged at least 4 times. A median response time of the individual subject was derived for each of the 12 differences. The stability or reliability of the individual response measurements is illustrated by the correlation between the medians for the 40 and 50 per cent difference. The correlation for 30 young subjects was 0.75, and the correlation was 0.80 for 43 elderly subjects.

Subjects: The subjects in this study were 30 young individuals aged 19 to 36 years and 43 elderly subjects aged 61 to 91 years. All subjects were male, white, and selected to represent a healthy non-hospitalized population. The ages of the elderly subjects were distributed as follows: 27, 60 to 69 years; 9, 70 to 79; 6, 80 to 89 years, and one subject aged 91. Of these subjects, 29 were employed full time, 9 were retired and lived in the com-

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munity, and 5 were housed in a religious home for the aged. Of the 30 young subjects, 26 were employed full time, and 4 were religious research volunteers.

RESULTS

Response time declined as a function of the difference in line lengths. This relation was apparent in both the young and elderly subjects (fig. 1). In general, there was an asymptotic value for the response time which was approached at about a 15 per cent difference in line lengths. For differences in line lengths greater than 15 per cent, it seems that variations in the stimulus has little effect upon the age difference in response time.

If the difference in line lengths is progressively made smaller than a 15 per cent difference, then the elderly group becomes relatively slower compared with the young group. This result was tested for statistical significance by taking the difference between the 1 and 50 per cent stimulus response times for each subject; the mean difference was significantly greater for the elderly group, $p<0.01$. The mean difference in response time was 0.47 sec. for the 1 per cent differences in line lengths and was 0.18 sec. for the 50 per cent difference in line lengths. The systematic change in the differences of response time between the two age groups is seen in figure 2. For all stimuli the age difference in response time was significantly different (table 1).

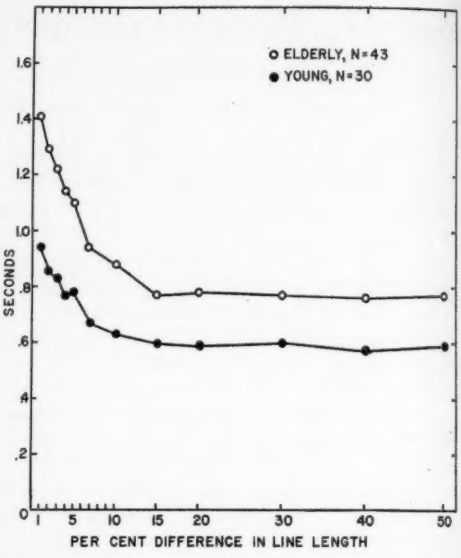

Fig. 1. Speed of response as a function of perceptual difficulty. The ordinate represents the vocal response time in judging line pairs. The abscissa represents the percentage difference in the two line lengths being judged as to which was the shorter, "right" or "left." The line graph connects the successive mean values for the two age groups.

DISCUSSION

One of the most general behavioral characteristics of aging is slowing of responses. The importance of this now well established observation is enhanced by the fact that patients

TABLE 1. AGE DIFFERENCE IN SPEED OF RESPONSE IN RELATION TO PERCEPTUAL DIFFICULTY.

Age Group	Percentage Difference in Line Length											
	1	2	3	4	5	7	10	15	20	30	40	50
61-91 years, N = 43												
Mean, sec.	1.41	1.29	1.22	1.14	1.10	.94	.88	.77	.78	.77	.76	.77
σ	.43	.51	.43	.43	.28	.24	.21	.16	.17	.17	.20	.20
σM	.066	.078	.066	.066	.043	.037	.032	.025	.026	.026	.031	.031
19-36 years, N = 30												
Mean, sec.	.94	.86	.83	.77	.78	.67	.63	.60	.59	.60	.57	.59
σ	.19	.17	.15	.11	.13	.09	.10	.08	.07	.08	.10	.085
σM	.035	.032	.028	.020	.024	.017	.019	.015	.013	.015	.019	.01
Mean difference	.47	.43	.39	.37	.32	.27	.25	.17	.19	.17	.19	.18
σdif.	.075	.084	.072	.069	.049	.041	.037	.029	.029	.030	.036	.034

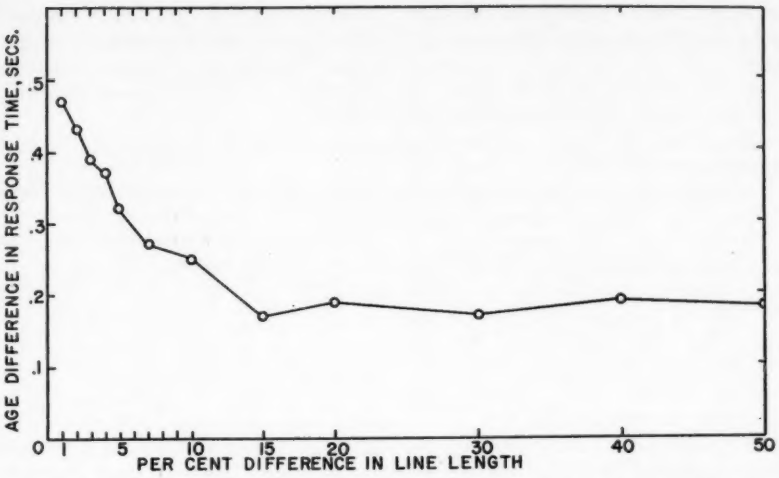

FIG. 2. Age difference in response time as a function of the percentage difference in line length judged as to which was the shorter. The ordinate values represent the mean difference in response time between a young and an elderly group of subjects; the abscissa represents the percentage difference between the lengths of pairs of lines judged.

with senile dementia show a much greater slowing of responses than control subjects of the same age (3). An important problem is, therefore, the localization of the slowing, both anatomically and functionally. In this context the task is to use the present results in an attempt to demarcate the change within some narrower functional limits than previously possible. That is, the task is to specify where in the total processes beginning with the stimulus and ending with an appropriate response does the increment in time with advancing age occur.

Age changes in visual and auditory acuity would seem to limit the intensity of stimulation and thus contribute the greater response time of the elderly. The present results show that as the stimulus is made difficult, i.e., the differences in line lengths is made small, that the elderly are relatively slower than young subjects. This factor is not the only influence upon the response time for it was also demonstrated that as the difference was made sufficiently large, the response time approached a minimum value. At this minimum level there was a residual difference between the response time of the young and elderly which was statistically significant. A previous study showed that the slowing was not limited to a particular mode of response, i.e., finger, foot, or jaw (4). There is thus no evidence which would prompt the idea that the elderly are uniquely slow in vocalization. It is more parsimonious in view of the evidence to regard the slowness in vocalized responses as part of a general slowing yet not specifically defined in site and nature (7).

There is evidence that for word associations the elderly produce written responses at a rate which is lower than that expected from their rate of copying words. "... the lower fluency of the elderly does not seem to be the result of simple inability to write quickly enough, since the elderly wrote fewer words in proportion to their potential writing speed than did the younger subjects" (1, p. 243). There is thus further evidence for Welford's contention that the deficit lies in organizing the information in the stimulus and relating it to relevant material from experience (9).

Further research is necessary to define the precise nature of age change in the relation of the stimulus to the response and to translate the functional information into the anatomic, physiologic, and experiential basis.

SUMMARY

1. The purpose of this study was to de-

termine to what extent perceptual difficulty might be a variable in age changes in response time.

2. Young and elderly subjects were required to judge which of two simultaneously presented lines was the shorter. The lines were presented tachistoscopically. Each subject made a minimum of 48 judgments in a series of line pairs which differed in length from 1 to 50 per cent. The subject was required to respond as quickly as he could when the stimulus lines were presented by saying "right" or "left" to indicate the side of the shorter line. The vocal response of the subject operated a voice key which interrupted a chronoscope circuit. The response time was measured to the nearest 0.01 sec.

3. The subjects where healthy males: The young group consisted of 30 individuals between the ages of 19 and 36 years; the elderly group consisted of 43 subjects between the ages of 61 and 91 years.

4. A significant difference in response time between the two age groups was found at all levels of stimulus difficulty. The response time of the elderly was relatively slower, however, when the stimulus difficulty was increased. Thus, the difference in response time between the young and elderly was 0.47 sec. for a 1 per cent difference in line lengths, and was 0.18 sec. at a 50 per cent line length difference.

5. It is apparent that perceptual difficulty can contribute to the slower response time of elderly subjects. However, there is a residual age difference in response time which exists regardless of ease of the perceptual task involved.

REFERENCES

1. Birren, J. E.: Speed of Simple Responses and Perception and Their Significance for Complex Behavior. *Old Age in the Modern World,* E. & S. Livingstone, London, 1955.
2. Birren, J. E., Allen, W. R., and Landau, H. G.: The Relation of Problem Length in Simple Addition to Time Required, Probability of Success and Age. *J. Gerontol., 9:* 150-161, 1954.
3. Birren, J. E., and Botwinick, J.: The Relation of Writing Speed to Age and to the Senile Psychoses. *J. Consult. Psychol., 15:* 243-249, 1951.
4. Birren, J. E., and Botwinick, J.: Age Differences in Finger, Jaw, and Foot Reaction Time to Auditory Stimuli. *J. Gerontol., 10:* 429-432, 1955.
5. Henmon, V. A. C.: The Time of Perception as a Measure of Differences in Sensations. *Arch. Psychol., 14:* 1906.
6. Kay, H.: Some Experiments in Adult Learning. *Old Age in the Modern World.* E. & S. Livingstone, London, 1955.
7. Singleton, W. T.: Age and Performance Timing on Simple Skills. *Old Age in the Modern World.* E. & S. Livingstone, London, 1955.
8. Szafran, J.: Experiments in the Greater Use of Vision by Older Adults. *Old Age in the Modern World.* E. & S. Livingstone, London, 1955.
9. Welford, A. T.: *Skill and Age.* Oxford University Press, London, 1951.

AGE DIFFERENCES IN STARTLE REACTION TIME OF THE RAT TO NOISE AND ELECTRIC SHOCK*

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Numerous studies have reported slowing of responses with advancing age in humans but there has been little attempt to isolate the problem or to find out to what extent animals display the same phenomenon. An important exception is the study of Brody who used reaction time in connection with his observations of the effects of hypophysectomy, thyroidectomy, and thyroxin injection in rats (3). The experimental endocrine variables had little effect on reaction time in contrast to a doubling of reaction time in the oldest control animals.

The purpose of this study is to verify the original observation of Brody for reaction time of the rat to electric shock and to study reaction time to a stimulus, noise, which would be free from local effects which might accompany electric shock.

METHODS

Cage: The reaction cage was clear plastic, 11 by 11 by 6½ in. The cage permitted freedom of movement for the rat and easy observation. After the placement in the cage the rat would explore continuously for several minutes and then settle down. In early studies a small confining cage was used which had to be rejected because the rats were in continuous movement to escape. The reaction cage was mounted in rubber on the 4 base corners, and the bottom center was flexibly coupled to a strain gauge. The movements of the animal were amplified and recorded. Sensitivity was adjusted so that respiratory movements were apparent in the records. Parallel copper tubes formed the floor of the cage for the rat; the tubes were so spaced as to permit droppings to fall through and not short the shock stimuli. The rat was stimulated when at rest.

Animals: The rats used in this study were albinos of the Sprague-Dawley strain. They were maintained in the same colony and were fed Purina Chow on an ad lib basis supplemented twice weekly with lettuce greens and raw horse meat. All rats were used to handling.

Noise stimulus: A "white noise," 20 to 20,000 cycles, was used as the auditory stimulus for the startle response. The stimulus was 52 db. over the ambient noise level, and was 0.10 sec. duration.

Shock stimulus: The electric shock was a direct current applied to the animal's feet through the copper tubes forming the cage floor. The stimulating circuit was designed to yield a reading of the current flow during actual stimulation thus eliminating the necessity for controlling the changes in resistance of the contact of the rat's feet with the copper tubing due to changes in moisture or grip.

Response measurement: The response time was read directly from an electronic scaler which began sweeping at the initiation of the stimulus and which was stopped by a movement of the animal. The noise or the shock usually evoked a startle jerk and then a running response. The initial movement was used in the time measurement. At least 7 responses were recorded for each animal. The median was used as the measure of central tendency for the individual animal because of the skewing of the distributions.

An estimate of the reliability of the reaction time measurement to shock was secured from an analysis of the data on 97 rats. The first 6 measurements were divided into odd-even categories and a median of each was obtained. The correlation between the two split-half medians was 0.63, yielding an estimated r of 0.80 for the median based upon 7 measurements, the minimum number for an individual animal.

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*The assistance of Mr. Joseph Brinley and Mr. Sam Umberger in the observations and rat handling is gratefully acknowledged, as are the suggestions of Dr. Eugene Streicher in planning the study. The apparatus used was designed and assembled by the Section on Technical Development, National Institute of Mental Health.

†Laboratory of Psychology, National Institute of Mental Health, National Institutes of Health, U. S. Public Health Service, Department of Health, Education, and Welfare.

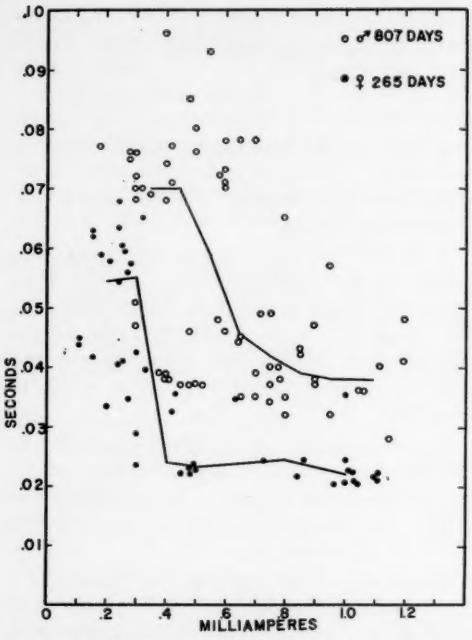

Fig. 1. Reaction time of the rat as a function of stimulating electric current applied to the feet. Individual measurements of reaction time are plotted for a young and an old rat. The curve connects median values for selected stimulus intensities.

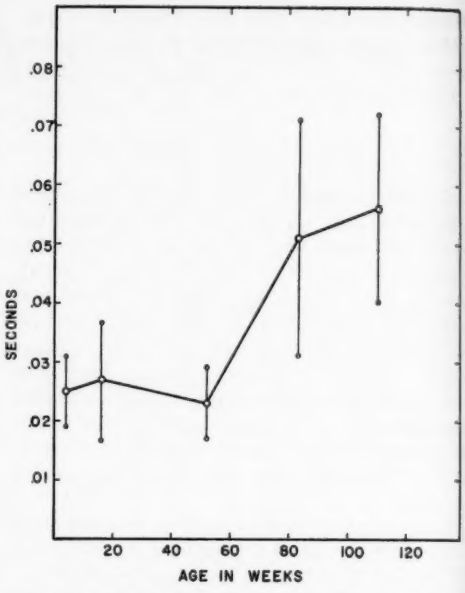

Fig. 2. Age differences in the auditory reaction time of the rat. The startle stimulus was a white noise of 52 db. The straight line graph connects the mean reaction time of successive age groups; the vertical line represents plus and minus one standard deviation about the mean. The number of animals in the successive groups are: 15, 22, 7, 16, and 16.

The reliability of the auditory reaction time was more difficult to determine since the animal would frequently fail to respond to several stimuli in a series. It was regarded as a more appropriate test of reliability therefore to correlate repeated observations on a group of animals on two different days. A retest correlation was made for 55 rats tested between 1 and 14 days apart. The obtained r was 0.62.

RESULTS

A significant slowing of reaction to shock stimuli was found in the oldest rats (table 1). The difference between the young adult and old rats amounted to about 29 per cent. There was no significant relation between reaction time and body weight or sex of the animals.

The age difference is not due to a difference in threshold to the shock stimulus since stimuli above about 0.6 ma. produce no further decrease in reaction time for young as well as old rats. The variability in reaction time changes with the stimulus intensity (fig. 1).

There was a significant correlation between age and reaction time to noise (fig. 2). The difference in reaction time between young adult rats and the oldest group was about a 100 per cent increase. The correlation between age and reaction time was 0.67, using a product moment correlation. If the cur-

TABLE 1. AGE DIFFERENCES IN REACTION TIME OF THE RAT TO ELECTRIC SHOCK.

	A	B	C
Age in Weeks..	4–9	21–33	85–121
Mean, Sec.....	.028	.028	.036
σ.....	.0039	.0052	.0075
σM.....	.0006	.0009	.002
N.....	45	33	13

*Age group C is significantly different, $P < .01$, from groups A and B.

vilinearity is taken into account using the correlation ratio, η, the correlation between age and reaction time was 0.73.

For both forms of reaction time the median was used to represent the central tendency of the measurements on an individual animal. This is particularly justified in the case of the reaction to sound when the animal frequently fails to respond or, because of his previous activity, shows a delayed or abortive startle response. The distributions may be typified as having a lower limit representing a physiologic minimum for response time. Factors contributing to the response time do not operate equally in positive and negative directions from this lower limit, i.e., the Gaussian error distribution does not apply, and one does not obtain a normal distribution.

DISCUSSION

There seems to be a significant change in reaction time of the older rat for both auditory and shock stimuli. The slowing of response does not, therefore, seem to be limited to a specific sensory defect wherein the inability to perceive the stimulus with sufficient intensity is the primary limiting factor. In part, however, the somewhat greater slowing with age in reaction time to auditory stimuli compared with electric shock may be the result of reduced auditory acuity in some animals. There were older animals in the present study which failed to show any response to sound. They were not, of course, included in the present results since they were presumed to be deaf, e.g., they would climb over the loud speaker whether or not the noise was being presented whereas the normal rat would jump and run as soon as the noise was turned on. Since an appreciable number of older animals appeared to be deaf, the rat may prove to be a useful animal in which to study age changes in audition.

There seems no reason to assume that the older rat would react more quickly if the sensory stimulation were increased. In the shock experiments, detailed studies of a limited number of animals showed that increasing the stimulation above 0.6 ma. produced no change in reaction time. The startle and avoidance behavior of the rat when exposed to the 52 db. noise level was such as to suggest that the level of stimulation was near noxious or painful; the rat would immediately turn its head and start running from the direction of the sound source.

Since rats display the slowing of reaction time with advancing age, superficially resembling, at least, the change in humans, (1, 2) it seems desirable to use the rat in attempts to localize the phenomenon with methods not possible with humans.

SUMMARY

1. Age changes in the startle reaction time of the rat to electric shock and noise were studied in 97 albino rats, Sprague-Dawley strain.

2. The individual rat was tested by being placed in a plastic cage mounted in rubber to which was attached a strain gauge. The output of the strain gauge was amplified and recorded. Initiation of startle movements of the rat in response to electric shock or to noise were measured. The shock stimulus was a direct current of at least 6 ma.; the auditory stimulus was a 52 db. white noise. In both instances the stimulus duration was 0.10 sec. Only one form of reaction time was measured for an individual rat on any given day. A minimum of 7 measurements were made per animal; the median reaction time was taken as the measure of central tendency for the animal.

3. Young adult rats of 11-21 weeks yielded a mean auditory reaction time of 0.027 sec. In contrast, rats between the ages of 105-119 weeks had a mean reaction time of 0.056 sec. The correlation between auditory reaction time and age was 0.73(η).

4. The age change in reaction time to electric shock was also significant. The difference between rats aged 21-33 weeks and rats aged 85-121 weeks was about 29 per cent; a statistically significant difference.

5. No relation was found between body weight, sex, and reaction time. The slowing of reaction time in the rat is not limited to a specific sensory defect since it was manifest in the present study in both shock and auditory reaction time. The slowing of reaction time with age in the rat appears to offer an opportunity for isolating the nature of the age change in the nervous system responsible for the slowing of responses, using experimental methods not appropriate in human

studies. Other species might be examined to ascertain to what extent the slowing of responses with advancing age is a general characteristic of aging of the mammalian nervous system.

REFERENCES

1. Birren, J. E., and Botwinick, J.: Speed of Response as a Function of Perceptual Difficulty and Age. *J. Gerontol., 10:* 433-436, 1955.
2. Birren, J. E., and Botwinick, J.: Age Differences in Finger, Jaw, and Foot Reaction Time to Auditory Stimuli. *J. Gerontol., 10:* 429-432, 1955.
3. Brody, E. B.: The Influence of Age, Hypophysectomy, Thyroidectomy, and Thyroxin Injection in Simple Reaction Time in the Rat. *J. Gen. Physiol., 24:* 433-436, 1940.

THE EFFECT OF AGE AND SEX ON THE DURATION OF HEXOBARBITAL ANESTHESIA IN RATS*

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The duration of hexobarbital anesthesia is a function both of the blood level of the drug and the sensitivity of the central nervous system to the barbiturate. In turn the blood level is related to liver detoxification rates, and the solubility of the agent in adipose tissue; and the sensitivity of the central nervous system may be modified by pathology.

In rats, sex differences in "sleeping time" have been observed, and the disparity has been attributed to the action of the sex hormones on the rate of transformation of the biologically active material (11). It therefore seemed possible that the duration of anesthesia would be an age-dependent variable because of temporal changes occurring both in the nervous system, as well as in the levels of circulating hormones (1, 7, 10). Beside the investigation of these relationships, experiments were performed in which anesthesia was prolonged by the administration of SKF 525A,‡ a drug which impairs liver detoxification (2, 4, 5, 6), and also chlorpromazine§ was administered. This drug increases the sensitivity of the brain to barbiturates (3), possibly by retarding cerebral activity or metabolism (8). It was anticipated that the use of these drugs to potentiate hexobarbital would help to define the site of the mechanism involved in any age differences.

METHOD

Unfasted male and female Sprague-Dawley rats 1 to 29 months of age were employed. Hexobarbital sodium (Evipal) was administered intraperitoneally at a dose of 75 mg./Kg. and "sleeping time" was measured. It was defined as the elapsed period between the loss and return of the righting reflex. In other experiments, SKF 525A (15 mg./Kg.) or chlorpromazine (15 mg./Kg.) was injected intraperitoneally 40 minutes prior to the administration of hexobarbital.

In a test of the reliability of the data, 30 rats randomly selected with respect to age and sex were reanesthetized with hexobarbital one week after the initial observation. The coefficient of correlation between the two sets of sleeping time measurements was 0.95 indicating high reliability and that the inter-animal variance in sleeping times was based primarily on constitutional factors and not upon unknown irregularities in the experimental procedure.

RESULTS

Although sex differences in sleeping time were virtually absent in 1 month old rats, a fourfold difference was found in 60 day old animals (fig. 1). At this age, mean sleeping time obtained for males was about 0.39 that of the 1 month mean; and for females, 1.3 the 30-day mean sleeping time. This difference was found for animals ranging in age up to 2 years, after which age a sex reversal in sleeping time was observed (table 1, fig. 1).

Both SKF 525A and chlorpromazine significantly prolonged anesthesia in all groups of rats (tables 2, 3). Their effects were most pronounced on the sexually mature females. The effect was to maintain the age and sex relationships observed with hexobarbital alone, although the absolute sleeping times were multiples of the unpotentiated values (tables 2 and 3).

At the drug dosages employed, experimental death was encountered more frequently in the older groups of rats. In all observations, regardless of the drug or sex, 4 of 161 rats below 1 year died, whereas 12 of 76 above 1 year died. This difference of 13 per cent in mortality is significant: $P<0.01$.

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*The authors wish to acknowledge the technical assistance of Mr. Joseph F. Brinley, who carried out the statistical computations.

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‡β-diethylaminoethyldiphenylpropylacetate hydrochloride.

§10-(γ-dimethylaminopropyl)-2-chlorophenothiazine.

These two compounds were obtained through the courtesy of the Smith, Kline, and French Laboratories of Philadelphia, Pa.

TABLE 1. DURATION OF HEXOBARBITAL ANESTHESIA.

Age (Months)	No.	Time ± 1 S.D. (Minutes)
	Male	
1	12	38.7*± 15.2
2	6	15.0 ± 5.3
6	14	15.4 ± 5.1
18–22	10	17.1 ± 6.2
27–29	3‡	62.3*± 17.8
	Female	
1	12	43.0 ± 15.2
2	7	56.4 ± 13.4
6	11	55.3 ± 15.6
18–22	13	57.8 ± 20.8
27–29	3	36.0†± 8.5

*Significantly different from all other groups of males: $p < .05$.

†Significantly different from 2 month old females: $p < .05$.

‡One of 4 animals died during the experiment.

(The sex differences in sleeping time observed in the 1 month old groups and in the 27-29 month old groups were not statistically significant: $p > 0.05$. For other paired age groups the differences were significant: $p < 0.05$.)

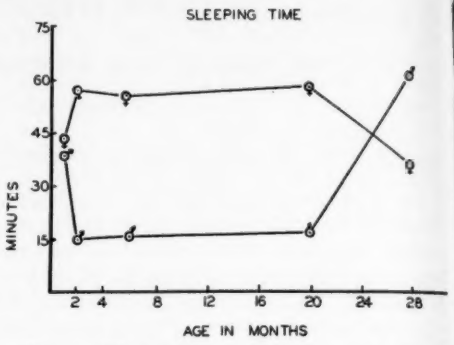

Fig. 1. Effect of age and sex on the duration of hexobarbital anesthesia.

DISCUSSION

Age changes in the duration of hexobarbital anesthesia parallel the reported development and decline of sex hormone levels in the rat as indicated either by measurements of reproductive activity or vaginal smears (9, 12). Apparently the most important factor underlying the observed age and sex differences is the differential action of androgens to increase, and estrogens to decrease the rate of hexobarbital detoxification (11). However, in the older age groups, neurophysiologic or

TABLE 2. EFFECT OF SKF 525A ON THE DURATION OF HEXOBARBITAL ANESTHESIA.

Age (Months)	No.	Time ± 1 S. D. SKF 525A	SKF 525A-Time / Control-Time	Mortality
		Male		
1	10	233.6*± 82.4	6.0	1/11
2	11	76.9 ± 39.5	5.1	0/11
9	14	88.7 ± 52.6	5.8	0/11
20	11	145.7†± 94.5	8.5	3/14
		Female		
1	9	277.7*± 42.7	6.5	1/10
8	4	471.3 ± 86.5	8.5	1/5
14	9	508.8 ± 90.9	8.8	3/12

*Significantly different from all other groups of same sex: $p < .05$.

†Significantly different from 1 and 2 month old males: $p < .05$.

TABLE 3. EFFECT OF CHLORPROMAZINE ON THE DURATION OF HEXOBARBITAL ANESTHESIA.

Age (Months)	No.	Time ± 1 S. D. Chlorpromazine	Chlorpromazine-Time / Control-Time	Mortality
		Male		
1	10	125.4*± 22.8	3.2	0/10
4	11	60.6 ± 17.9	4.0	0/11
9	10	49.7 ± 19.6	3.2	0/10
20	8	62.7 ± 15.3	3.7	2/10
		Female		
1	9	143.4*± 28.2	3.3	1/10
4	10	288.5 ± 123.4	5.1	0/10
14	7	293.7 ± 108.6	5.1	3/10

*Significantly different from all other groups of the same sex: $p < .05$.

neuropathologic factors may be superimposed upon hormonal influences. This is indicated by a higher incidence of mortality in the older animals which in all likelihood succumbed to barbiturate depression of the respiratory center. These considerations may also be associated with the prolonged sleeping time of the 27-29 month old males which remained anesthetized approximately twice as long as the 1 month old sexually immature rats. It is possible, however, that systemic pathology may also be involved.

Both SKF 525A and chlorpromazine had essentially similar effects, i.e., to increase the duration of anesthesia by several fold, despite the fact that their mechanisms of action are reportedly quite dissimilar (2, 3). The result was to magnify the absolute differences among the various groups of rats, but the essential relationships established with hexobarbital alone remained largely undisturbed, although relatively larger effects of the two compounds on the sexually mature females were found.

SUMMARY

Age and sex differences in the duration of hexobarbital anesthesia in Sprague-Dawley rats are described, together with the potentiating effects of SKF 525A and chlorpromazine. The results are as follows:

1. The duration of anesthesia, "sleeping time," in sexually mature females is about 4 times as long as in males of the same age.
2. The sex difference in sleeping time is not significant in very young or very old rats.
3. Sleeping time apparently parallels sex hormone levels; mature females sleeping longer and mature males less than very young or very old animals.
4. The effect of potentiating drugs is to increase the sleeping time in all age groups, but the age and sex relationships remain undisturbed.
5. The mortality attributable to the drugs is greater in the older animals.

An explanation for these results is offered, based upon the known effects of sex hormones upon barbiturate anesthesia. In addition, the role pathologic factors may have in modifying the response, especially in older animals, is discussed.

REFERENCES

1. Apogi, E.: Anesthesia in the Aged. In: Lansing, A. I., Ed., *Cowdry's Problems of Ageing*. Williams and Wilkins Co., Baltimore, 1952.
2. Axelrod, J., Reichenthal, J., and Brodie, B. B.:

Mechanism of the Potentiating Action of β-Diethylaminoethyl Diphenylpropylacetate. *J. Pharm. Exper. Therap., 112:* 49-54, 1954.

3. Brodie, B. B., Shore, P. A., and Silver, S. L., and Pulver, R.: Potentiating Action of Chlorpromazine and Reserpine. *Nature, 175:* 1133-1134, 1955.
4. Cook, L., Macko, E., and Fellows, E. J.: The Effect of β-Diethylaminoethyl Diphenylpropylacetate Hydrochloride on the Action of a Series of Barbiturates and C.N.S. Depressants. *J. Pharm. Exper. Therap., 112:* 382-386, 1954.
5. Cooper, J. R., Axelrod, J., and Brodie, B. B.: Inhibitory Effects of β-Diethylaminoethyl Diphenylpropylacetate on a Variety of Drug Metabolic Pathways In Vitro. *J. Pharm. Exper. Therap., 112:* 55-63, 1954.
6. Cooper, J. R., and Brodie, B. B.: Enzyme Systems Involved in the Biotransformation of Barbiturates. *J. Pharm. Exper. Therap., 110:* 12, 1954.
7. Critchley, M.: Aging of the Nervous System. In: Cowdry, E. V., Ed. *Problems of Aging.* Williams and Wilkins Co., Baltimore, 1942.
8. Grenell, R. G., Mendelson, J., and McElroy, W. D.: Effects of Chlorpromazine on Metabolism in Central Nervous System. *Arch. Neurol. & Psychiat., 73:* 347-351, 1955.
9. King, H. D.: Life Processes in Grey Norway Rats During Fourteen Years in Captivity. *American Anatomical Memoirs,* No. 17, 1939.
10. O'Leary, J. L.: Ageing in the Nervous System. In: Lansing, A. I., Ed., *Cowdry's Problems of Ageing.* Williams and Wilkins Co., Baltimore, 1952.
11. Quinn, G. P., Axelrod, J., and Brodie, B. B.: Species and Sex Differences in Metabolism and Duration of Action of Hexobarbital (Evipal). *Federation Proc., 13:* 395-396, 1954.
12. Slonaker, J. R.: The Effect of Pubescence, Oestruation and Menopause on the Voluntary Activity in Albino Rats. *Am. J. Physiol., 68:* 294-315, 1924.

BOOK REVIEWS

CEREBRAL VASCULAR DISEASE, by Irving S. Wright and E. Hugh Luckey, Grune & Stratton, Inc., New York, 1955, 167 pages, $5.50.

This volume represents a valuable addition to gerontologic literature. The publication constitutes a report of a conference on cerebral vascular diseases, conducted in January, 1954, at Princeton, New Jersey, under the chairmanship of I. S. Wright. The book contains 14 chapters dealing with various aspects of cerebral vascular disease. Several of these chapters contain important basic information on the embryology, anatomy, physiology, and pathology of the circulatory system of the brain, whereas in other sections the neurologic symptoms, clinical diagnostic procedures, and pharmacotherapeutic and surgical aspects of the cerebral vascular diseases are considered.

Each chapter of the volume is followed by an often detailed discussion of the particular problem by various members of the conference. The main value of the book, in the opinion of the reviewer, lies in the many significant and concise statements made by the 34 participants in the meeting, all of whom must be considered as authorities in their fields. In accordance with the current practice in this country the informality of the discussion is retained in the transcript. Although many conservative readers probably would prefer a more formal editing of the discussions, the ability of the conference members to express themselves clearly is evident throughout the chapters, for which reason the informal style of the transcript in the present case does not detract much from the readability of the book.

The participants in the meeting stress the fact that the field of cerebral vascular disease, in spite of its outstanding medical and social significance, is as yet relatively undeveloped. The report of the conference should help to emphasize this point.

Although one of the chapters in the book deals with the chemistry of the brain, only the gross chemical aspects are considered, the reference to the enzyme systems and metabolic pathways of the brain tissue being incidental. A thorough treatment of the metabolism of brain tissue under normal and pathologic conditions would have been of great interest to readers engaged in biochemistry, but it is understandable if this subject was considered to be too extensive to include in the three day conference.

Only 5 of the 14 chapters in the book are followed by a list of literature references. In view of the undeveloped stage of the field of cerebral vascular disease it might have been helpful if a more extensive use of bibliographies had been made.

The book as a whole serves in an effective way to outline the present state of knowledge and to abolish several widely held misconceptions. Because of its factual character and rather extensive reference to clinical problems the publication should prove most useful both to gerontologists and geriatricians.

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St. Louis, Missouri

SYMPOSIUM ON ATHEROSCLEROSIS, National Academy of Sciences—National Research Council Publication 338, Washington, D. C., 1955, 249 pages, $2.00.

The report of this symposium, conducted March 22 to 23, 1954, under the auspices of the Division of Medical Sciences, National Academy of Sciences, National Research Council, constitutes a comprehensive review of the current status of the various problems pertaining to atherosclerosis. The publication contains 25 separate papers with literature references and 5 main summaries. Each paper is followed by an abstract of the discussion of the subject. These abstracts are brief and concise and constitute only about 10 per cent of the total number of pages in the volume.

In view of the rapid development in recent years within the field of atherosclerosis the appearance of a well edited book covering nearly all the areas in which research is proceeding is of considerable importance. The close adherence to the subject, precise style, and balanced presentation contribute further to the value of the publication. It is hoped that the high quality and low price of this book will result in its wide distribution both in the United States and abroad.

J. E. KIRK
St. Louis, Missouri

CIBA FOUNDATION COLLOQUIA ON AGEING, VOLUME I, AGEING—GENERAL ASPECTS, Edited by G.E.W. Wolstenholme and Margaret P. Cameron, Little, Brown & Co., Boston, 1955, 255 pages, $6.75.

This volume contains 16 papers presented at a symposium in London July 13 to 15, 1954 (immediately preceding the International Congress on Gerontology). The symposium was supported by the Ciba Foundation of London. Eight of the papers are from the United States, 7 from England, and 1 from Norway. There is also discussion by 18 other participants, (1 from United States, 7 from the United Kingdom, 6 from Switzerland, and 1 each from Belgium, Australia, India, and East Germany).

The papers deal with several aspects of gerontology: 4 on physiology, 3 pathology, 3 nutrition, 2 biochemistry, 2 mental, 1 psychology, and 1 on mortality data. The papers average 11½ pages each in addition to an average of 4 pages of discussion in fine print. Five of the 16 papers have either a summary or conclusions.

The papers are not intended as an exhaustive treatise on gerontology—or any aspect of it. They discuss advances in selected phases of the subject. Therefore, the volume constitutes an addition to a library on gerontology rather than a reference book.

Although printed in Boston, the book was edited in England. This accounts for the spelling of "ageing" with an "e". In America, the Journal of Gerontology spells it without an "e" in order to be consistent with similar words, such as caging, paging, raging, etc.

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BOOKS RECEIVED

Books received since May 1 are acknowledged in the following list:

A Textbook of Medicine, 9th edition, edited by Russell L. Cecil and Robert F. Loeb, W. B. Saunders Company, Philadelphia, 1955, 1786 pages, $15.00.

Cerebral Vascular Disease, by Irving S. Wright and E. Hugh Luckey, Grune & Stratton, Inc., New York 1955, 167 pages, $5.50 (reviewed in this issue, page 445).

Ciba Foundation Colloquia on Ageing, Volume I. Ageing—General Aspects, edited by G. E. W. Wolstenholme and Margaret P. Cameron, Little, Brown & Co., Boston, 1955, 255 pages, $6.75 reviewed in this issue, page 445).

Ciba Foundation Colloquia on Endocrinology, Volume VIII, The Human Adrenal Cortex, edited by G. E. W. Wolstenholme and Margaret P. Cameron, Little, Brown & Company, Boston, 1955, 655 pages, $10.00.

Clinical Biochemistry, 5th edition, by Abraham Cantarow and Max Trumper, W. B. Saunders Company, Philadelphia, 1955, 738 pages, $9.00.

Medical Progress, edited by Morris Fishbein, McGraw-Hill Book Co., Inc., New York, 1955, 346 pages, $5.00.

The Practice of Dynamic Psychiatry, by Jules H. Masserman, W. B. Saunders Company, Philadelphia, 1955, 790 pages, $12.00.

The Psychiatrist and the Dying Patient, by K. R. Eissler, International Universities Press, New York, 1955, 338 pages, $5.00.

Symposium on Atherosclerosis, National Academy of Sciences—National Research Council Publication 338, Washington D. C., 1955, 249 pages, $2.00 reviewed in this issue, page 445).

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Psychological and Social Sciences, Social Work and Administration

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AGE AND PERFORMANCE OF TWO WORK GROUPS*

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During World War II, American industry found itself dipping deep into its labor reserve. Much of this reserve was made up of older persons, almost two and a half million more workers 45 and older being in the labor force in 1945 than under "normal" pre-war conditions. Estimates of future population indicate that much of industry's manpower will have to come from older ranks; by 1975, persons 45 years old and over will constitute nearly half of all persons over 20 years of age (1). In the event of national emergency, older persons will again have to be employed in great numbers.

This study seeks to examine some of the assets and liabilities of the older worker, as well as criteria by which he is judged. The orientation is in terms of criteria actually used in a manufacturing concern of 5000 employees to judge its sales and supervisory personnel.

METHOD

1. *Supervisory Personnel.* Three measurements were officially used by the Company to judge its supervisory personnel—nomination data or rankings by superiors as to general merit, forced-choice ratings, and graphic ratings. The analyses presented here deal mainly with the ratings, since they give more description than the ranked data which were used to establish the relative worth of the two rating devices. Primary emphasis was given to the forced-choice data in view of its higher validity as established against the nomination data.

Validity was computed in two ways. First, forced-choice ratings were correlated with unanimous placement by nominators in the extreme thirds of their rankings. For the 150 cases obtained, the resulting biserial and point-biserial coefficients were .86 (.66 when corrected for widespread classes) and .68 respectively. All are significant at the .01 level. Secondly, in a procedure designed to minimize the relationship, the product-moment correlation between forced-choice scores and *average* nomination score for 369 ratings was found to be $r = .50$. This is also significant at the .01 level. The forced-choice instrument would thus seem to have validity for the age comparisons to follow.

The reliability would also seem adequate, the odd-even correlation for the 369 ratings being $r = .93$. (This coefficient is extrapolated via Spearman-Brown formula.) Again, the correlation with an equivalent forced-choice form was $r = .92$.

Among the advantages for the forced-choice technique, as listed by Richardson (2), is its tendency to force a rater to describe rather than evaluate, and, in so doing, to provide for a more accurate description of a man than can be obtained where description is linked directly to a score. The scale used was composed of 160 items arranged in 12 blocks of 5 alternatives each, the rater's job being to pick the most and least descriptive items in each block. For the purpose of age analysis, the 87 subjects aged 50 and over were compared with the 114 less than 35 years of age on each of the items. The findings later presented are based upon the number of items showing significant age differences as well as upon the nature of these differences.

As previously mentioned, the Company also used a graphic rating scale in evaluating its supervisory personnel. This scale consisted of 9 subscales, each representing a different aspect of work performance, and each scorable on a 5 point basis. Although the graphic device had lesser validity than the forced-choice one, it still seemed worth while for purposes of age analysis. Its biserial correlation with unanimously nominated high and low criterion cases was found to be .65 (.42 when corrected for widespread classes).

2. *Sales Personnel.* Three work measurements were also available for salesmen. One of these was a nomination score equivalent to the one used with supervisory personnel. The nominators, in this instance, were sales

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management of the Company. In addition, 9 different sales performance records were available. These were objectively measurable, concerning such evidence of merit as amount of sales, amount of supervision required, etc. They were especially valuable in that each had significant correlation with the nomination data.

Finally, where sales performance could not be measured objectively, management made ratings on the more intangible aspects of performance. Fifteen graphic rating scales, most of them significantly related to nomination standing, constituted the evidence. For all three measurements, the relationship of performance to age is herein presented.

RESULTS

1. *Age and Performance of Supervisory Personnel.* As shown above, there are 320 responses possible on the forced-choice rating scale. It was found that 71 of these responses, or only 22 per cent, showed statistically significant differences (.05 level or less) between younger and older supervisors. Under the forced-choice design, however, not all of the responses carry a score. Of the 71 responses showing age differences, in fact, 25 do not have score weights. Consequently, only 45 of the possible 320 items are such that they may be termed valid discriminators between younger and older supervisors. It may be contended, therefore, that valid age differences are quite small.

TABLE 1. NUMBER OF ITEMS FAVORING YOUNGER AND OLDER SUPERVISORS IN RATIONAL GROUPINGS.

Category	Items Favoring Young	Items Favoring Old	Total
Experience	2	5	7
General attitude	3	0	3
Routine performance	4	0	4
Organizing and Planning	6	1	7
Relations with others	10	0	10
Initiative and drive	13	2	15
Promotability	25	0	25
Total	63	8	71

Where differences do exist, however, they reveal interesting patterns. When three psychologists and three personnel managers of the Company sorted the items, it was found that they fell mainly into 7 logical categories. By comparison of the scores obtained by younger and older subjects in each of the groupings, characteristic age patterns were discovered. As shown in table 1, the older supervisor has only one advantage, e. g., "Education, Training, and Experience." The items here classified portray the older worker as having somewhat better job knowledge, training, and experience.

The older supervisor has slightly less value than younger ones on "General Attitude," "Routine Performance," and "Organization and Planning." He is even less favorably appraised on "Initiative" and "Relations with Others," but he rates lowest, as compared with the younger, on items which were grouped under the general heading of "Promotability"—as "wants to advance," "can develop along any line," "will become more and more valuable," "worth training for the future," and other items apparently not descriptive of the present job worth of older employees. The finding is especially serious in that all of the promotability items carry weights in the scale, whereas fewer than half of the remaining age-significant items carry such weights.

TABLE 2. MEAN SCORES OF DECADE AGE GROUPS ON EACH OF 9 GRAPHIC SCALES AND THE TOTAL GRAPHIC SCALE.

Rating Characteristics	Age			
	25–34	35–44	45–54	55–64
Quality of work	4.2	4.3	4.1	4.2
Cost control	3.9	4.0	3.9	4.2
Planning and organizing work	4.0	4.0	3.8	3.9
Decision making	4.1	4.1	3.9	4.1
Initiative	3.8	3.9	3.6	3.8
Cooperation	4.1	4.1	3.9	4.4
Delegation	3.3	3.8	3.3	3.6
Ability to advance	3.7	3.7	3.2	3.0
Education and experience	4.1	4.0	4.1	3.9
Total score	3.9	4.1	3.8	3.9

Table 2 shows the mean scores (5 is high and 1 low) for each of 4 age groups. Examination of the trends shows the older supervisor excelling younger ones on cooperation and cost control. Other characteristics show no clear trends with age, except for the previously noted decline in ability to advance or promotability. On the graphic scale as on the forced-choice one, we again find a condition which may exist more as a function of the years of service remaining to a man than in terms of his present job worth.

2. *Age and Performance of Sales Personnel.* Three appraisals were available for salesmen: Nomination scores, production records, and graphic ratings. Nomination scores of salesmen, as shown in table 3, show a positive relationship with age. However, older supervisors (both sales and non-sales) are not rated as high as younger ones.

TABLE 3. MEAN NOMINATION STANDARD SCORES (M = 30; SD = 10) BY AGE GROUP, SALESMEN VS. SALES SUPERVISORS VS. OTHER SUPERVISORS.

Group	Age				N
	25-34	35-44	45-54	55-64	
Salesmen	25.9	30.3	33.0	34.1	472
Sales supervisors	25.4	29.1	30.6	22.8	59
Non-sales supervisors	29.2	32.0	30.0	27.1	402

Positive relationships hold also for sales production records and graphic ratings. Table 4 shows data for 129 salesmen for whom full-year production records were available and who were unanimously placed in high or low criterion groups by sales management in a nomination procedure.

Table 5 shows results for 176 salesmen who were both rated and placed in one of the nomination criterion groups. In both tables, the coefficients shown for criterion group standing (r_c) are point-biserials; those for age (r_a) are product moment coefficients.

In table 4, older salesmen are seen to have higher total sales as well as higher sales of the two components of total sales, i. e., specialty and bulk sales. (Correlations of .17 are significant at the .05 level, correlations of .23 at the .01 level). They also realize more of the objective set by management and of the territory potential. As an additional advantage, they require less supervision. The r_c column of the table shows these same efficiency measures to be of value as judged by criterion group standing.

TABLE 4. CORRELATIONS OF CERTAIN INDICATIONS OF EFFICIENCY OF 129 SALESMEN WITH GENERAL APPRAISAL BY SUPERIORS (r_c) AND WITH AGE (r_a).

Efficiency Measurement	r_c	r_a
Total sales	.68	.28
Total sales as % of district average	.82	.33
Specialty sales as % of district average	.74	.30
Bulk sales as % of district average	.70	.27
Supervision required	−.31	−.22
% Travel expenses to sales	−.37	−.16
% Total sales to territory potential	.42	.22
Sales objective set	.58	.41
% Objective met	.34	.31

Examination of the age–graphic scale relationships in table 5 reveals something of the reason for the higher value of these older salesmen. For the 176 cases involved, correlations of .16 and .21 are significant at the

TABLE 5. CORRELATION OF RATINGS OF 176 SALESMEN BY SUPERIORS WITH GENERAL APPRAISAL (r_c) AND AGE (r_a).

Rated Characteristic	r_c	r_a
Individual drives	.79	.24
New product sales	.65	.00
Size of orders	.79	.26
Stock inventory work	.57	.22
Display work	.52	.27
Record keeping	.73	.20
Equipment care	.10	.01
Route conformity	.31	−.09
Time spent on job	.52	.22
Planning sales presentation	.58	.09
Selection of "push" items	.49	.07
Market need appraisal	.56	.22
Customer relations	.55	.30
Product knowledge	.67	.59
Physical stamina	.51	−.23

.05 and .01 levels, respectively. The largest age correlation found is between age and product knowledge. Since the Company carries over 1000 items in its catalog, a man may require years to get to know the technical characteristics of the majority of them. The older salesman is also rated significantly higher in customer relations and market need appraisal. The only significant disadvantage for the older salesman, in fact, appears in the negative correlation with physical stamina. In view of the other findings, this does not seem to be any great handicap. Indeed this would seem to be an area of work where older men often may not only hold their own but, perhaps, through greater experience even excel younger ones.

DISCUSSION

As indicated by both production and rating data, older salesmen are here found more competent than younger ones. Their arbitrary retirement at age 65 means in many cases a substantial loss to the Company. Whether sales are measured in total or broken into their components, the older salesman in this Company is still found superior. That the explanation does not lie in management's assigning more desirable territories to older men in former years is shown by the fact that the older are still superior even when the potential of the territory is taken into account. Table 4 also shows that management has not particularly pampered its older salesmen. Note that higher objectives are set for them and are met by them.

The only explanation for the superiority of the older salesmen, as far as these data are concerned, may be found in the correlation between age and rating of product knowledge (table 5, $r = .59$). The vast product line and the technical nature of the line would lead one to expect that years of experience may be required for proficiency to be attained. This experience interpretation would not seem to detract from the validity of the age findings. The writer knows of no way of getting years of experience without, at the same time, aging.

One other explanation may modify the interpretation somewhat. It may be that selective retention enters into the picture, i. e., only the better salesman may survive, either through self-choice or management action. Even in this case, however, an argument may be presented, if not for hiring of older men, at least for retention of the successful older salesman past the present fixed retirement age as established in Company policy. In short, the sales area of the Company would seem to be one in which older men may operate more efficiently than younger ones.

The age implications of the supervisory data seem to exist mainly in the nature of systems used to evaluate older personnel. In view of the fact that few items were found to show valid age differences, older supervisors compared favorably to younger ones on two different merit rating systems. However, on Promotability characteristics of both scales they show considerable decrement. Here the discount is probably far more in terms of the few years left for advancement than on present competency. This particular rating scale characteristic, in other words, would seem logically inappropriate for judging older workers. There is the additional implication that any rating scale must be studied carefully if it is to be used in aiding administrative decisions such as retention or transfer of older workers.

SUMMARY

The study brings together a variety of appraisals of sales and supervisory employees in a large manufacturing concern.

Rating forms seemed unfairly to rate down older supervisors on items involving promotability. Older men may rate lower on such items merely because they are shortly to be retired, rather than as a reflection of present job worth.

Older salesmen were found superior in both sales and rated competency. The finding would seem to argue against a fixed retirement age for salesmen of this particular Company. Their advantage would seem to reside in their years of experience in a complex operation.

It is concluded that industrial policy regarding the older worker may often require critical review and that the older worker may have been undervalued in several respects.

REFERENCES

1. Bureau of Labor Statistics. *Employment and Economic Status of Older Men and Women.* Government Printing Office, Washington, D. C., 1952.
2. Richardson, M. W.: Forced-Choice Performance Reports: A Modern Merit Rating Method. *Personnel, 26:* 205-212, 1949.

RESEARCH PROBLEMS IN GERONTOLOGY

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IT IS WELL known that with increasing age the body begins to undergo changes which are generally accepted as representing a deteriorative process. The general observations regarding these changes have been investigated and documented by numerous practitioners and scientists who have built a wealth of literature on the physiologic, anatomic, and histologic changes occurring in this age period. Unfortunately, however, these changes have not been found to correlate in any meaningful manner with the psychologic and social changes which may occur in this same age period. It is a well known fact, for example, that the characteristic senile plaques found in the cortex and other areas of the aged brain bear no meaningful relationship to mental changes, this having been demonstrated in non-psychiatric as well as psychiatric brains (17). There is little disagreement, however, that this wealth of literature describes changes that occur to a greater or lesser extent in all individuals as they become older. On the other hand, an examination of the psychiatric and psychologic literature on gerontology reveals no such agreement even as to the changes that may occur in these areas. The assumption seems to be, however, that regardless of the degree of physiologic deterioration, there is a concomitant mental deterioration which, ipso facto, is due to age (3). This negative assumption has been the a priori stimulus for a considerable amount of research and investigation which has attempted to demonstrate empirically that the older person is the mental as well as the physical inferior of the younger individual. To this writer's knowledge, it is only recently that any studies have been conducted which demonstrate that an old person is at least as efficient in some ways as his younger competitor (19). None are known which have attempted to demonstrate a superiority in any area.

When the gerontologic literature is examined it is immediately apparent that most of our data have been obtained from studies of aged inmates of mental institutions and homes for the senile and infirm. It is from this type of population that generalizations are made regarding old people in general. Extremely scant data are available as to the functioning, "normal" aged individual, a point whose importance cannot be minimized. The consideration and care given to the control of sampling factors by Havighurst (10) are not only rare but almost non-existent. Even if we are willing to ignore many of the variables and reasons for institutionalization during this age period, we certainly cannot overlook the possible differences in motivation and self-concept between independent and institutionalized persons, which even on a logical basis would seem to play a great role. Mason (14, 15) in her recent studies investigated these factors and demonstrated their importance for consideration, theory, and future research. Motivation and its effects and ramifications regarding personality as we measure it have been widely investigated and must certainly be considered when dealing with people about whom such negative feelings are rife, and who, in so many instances, manifest these same feelings about themselves (14).

Not only are we prone to generalize far beyond our data, as well as to ignore the differences in populations with which we are dealing, but we set out to investigate our subjects with a variety of techniques and methods which have not been demonstrated to be valid instruments for use with aged populations. Whether or not these techniques are adequate for the purpose and whether they measure the same factors all along the age continuum is for the most part overlooked, despite repeated cautions by many writers in this area as early as 1941 (2, 6, 9).

The problem of the possible inability of our instruments to tap the same resources as we go up the age scale has been given considerable attention regarding the measurement of intelligence, and little elsewhere. The curve of intelligence has been demonstrated to reach

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a peak between the second and third decade of life (11, 29) and to start its decline thereafter. As age increases, however, test scores show increasing variability, which, while demonstrating the caution to be exercised in making general statements, gives further strength to the argument that the same functions may not be measured (9). The oldster when compared with younger persons shows a decline and is, therefore, considered to be less efficient. It is not this writer's intent to deny that decrement, as measured by these standard tests, does occur. What is decried is the fact that there is no provision for measurement of experience and wisdom, and no attempt to do so seems forthcoming. Furthermore, Dennis (9) states, ". . . little attention has been paid as to whether the tasks which are included in mental tests are tasks which also occur outside the testing situation." The decreased efficiency in life situations remains to be demonstrated adequately. Dennis further points out that no tests have been devised which either demonstrate the oldster to be superior to the younger man or evidence increases occurring after the second decade. As measured by psychologic tests, even the absolute decrement in performance has been shown to be lessened when power rather than speed is the important consideration (22).

In a recent study, Bayley and Oden (4), using Terman's gifted people as subjects, repeated the power tests used 12 years previously with these same subjects. It was found that the type of knowledge and ability measured by these tests increased with age. While the facts that these subjects were quite superior in intelligence and, therefore, atypical, and that the upper age extreme of the subjects was only 50 years are not overlooked as far as their direct applicability is concerned, still, the implications of these findings for gerontology are obvious. It is only a step to apply these findings to older persons at other levels of intelligence and to conduct further longitudinal work with such tasks.

At this point it is considered worth while to mention the difference between statistical and practical significance, which in generalizing from research findings is often confused or neglected. Rarely has it been demonstrated that the differences obtained between older and younger groups on some task have any practical meaning despite the highly significant statistical differences obtained. While this criticism is certainly not peculiar only to this area, it is of considerable importance if gerontologic research is to have any value or effect in dispelling some of the fallacious attitudes toward older persons. A study by Obrist (18) investigating simple reaction time with groups of subjects 18-39, 65-75, and 76-86 years old yielded mean reaction times to an auditory stimulus of 0.122, 0.131, and 0.145 seconds, respectively. While these differences are statistically significant, their practical implications remain to be demonstrated and would seem to apply only to the most specific and atypical situations. It is of interest to note that even with such a simple task the differences between subjects within an age group were considerable, with up to 15 per cent of the oldest group having reaction times equaling or bettering the mean of the youngest group, findings which certainly demonstrate the fallacy in thinking of a typical older person or in generalizing that the older person has necessarily "slowed down."

The problem of identity of measurement by tests along the age continuum is given considerable weight in this discussion as it is of paramount importance in any discussion of the personality of the aged and research in this area. Many stereotyped ideas exist as to what the aged person is like and are often the negative starting points for investigation. In 1946 Klopfer (13) examined 50 subjects above the age of 60 by means of the Rorschach test. Twenty of the subjects were non-institutionalized and 30 were residents of institutions. From the obtained protocols conclusions were drawn about the personalities of these people based on the usual, accepted interpretative meanings of Rorschach variables. Similar studies have since appeared (1, 7, 20), and all drew conclusions about the personalities of their subjects based upon usual Rorschach interpretations. Caldwell (6) took such interpretations to task and attempted to examine their validity, presenting data of her own along with her comments and cautions. She pointed out that while the fairly consistent results obtained on these various research studies indicate that the test is measuring the same thing in these various samples, the question remains as to what is being measured. "The assumption is made that the rationale of the test variables does not change with age,

and, since different profiles are found at different age levels, these must represent changes within the individual" (6). Such a conclusion remains to be tested. The results of Caldwell's study indicate correlations between supposed personality factors and intelligence in this age group as well as indications that many of the factors supposedly influenced by age are less affected by age per se than they are by other variables as yet unknown. Even more important, however, are her reminders that the Rorschach is, after all, primarily a perceptual task, and that perceptual differences may exist independent of personality, possibly on a physiologic basis. Despite the considerable research demonstrating the relationship between personality and perception, the two terms are not synonomous.

While the developmental personality is of importance in psychiatry, in the area of gerontology it is often overlooked or only paid lip service for research purposes. Some consideration is being given this important factor despite the considerable difficulties encountered due to impaired memories of subjects, death of respondents, etc. In a recent study Sands and Rothschild (21), although admittedly presenting inadequately controlled, gross data, formulated a socio-psychiatric theory of reactions to aging which is based upon life-long personality patterns. If followed up and tested by controlled experiments, this could lead to a contribution of considerable import.

The personality of the individual prior to old age, and its influence upon his reactions to encroaching senility is not a new concept by any means. As Plato observed, "He who is of a calm and happy nature will hardly feel the pressure of old age, but to him who is of an opposite disposition, youth and old age are equally a burden." How true this may be, and the mechanisms involved, must be subjected to research and investigation rather than be accepted at face value.

As most studies in this area are cross-sectional rather than longitudinal, the results obtained demonstrate age differences rather than age changes, a point overlooked in our generalizations from research data (9, 23). Furthermore, Dennis (9) has pointed out that people who are 75 years old today differ in many other respects besides age from those who are 25. While we may equate groups of old and young subjects on such usual variables as education, intelligence, and socio-economic background, overlooking the fact that our culture has changed drastically in the last fifty years fails to consider the vast differences in meaning and experience for these variables. Matching groups on such factors as the above seems fruitless and leads to the erroneous security of believing that we have controlled variables which may still have considerable influence upon our data. Wechsler (30) in standardizing his revised adult intelligence scale takes cognizance of this and has prepared tables which enable the older person to be compared with his age peers. Adequate studies exist which demonstrate the effects of cultural differences on personality and on various psychologic tests such as the Rorschach. Such drastic changes as have occurred in the last half century may in many respects be tantamount to having developed in different cultures as far as the comparison of old and young persons is concerned. With regard to psychologic tests, particularly projective tests, many of the differences between young and old may be accounted for on the basis of different experiences common to the respective groups (8).

The physical changes associated with the aging process and the concomitant increase in somatic complaints and ailments are for unknown reasons overlooked in gerontologic research, unless it is these factors themselves which are under investigation. Cerebrovascular accidents and arteriosclerotic changes, as well as various other neurologic conditions, are ignored, while supposed differences found in intelligence and personality between old and young groups are attributed to the aging process. It must be admitted that in this respect the psychologist is far more guilty than his psychiatric colleagues. Visual acuity, which is known to have a considerable incidence of decrement with age, was not controlled, for example, in any of the Rorschach studies mentioned, despite the visuoperceptual nature of this task. It is of further interest to note that there is evidence to suggest that color vision may deteriorate with advanced age (5, 12, 26), although the confounding of the evidence with differences in visual acuity leaves this still uncertain. It remains a possibility to consider, especially when the subject's reactions to color on cer-

tain psychologic tests has important implications for the evaluation and assessment of personality.

The shortcomings and methodologic problems discussed here are certainly not novel and merely represent the application of accepted concepts and procedures of experimental investigation to a relatively new area of interest. The newness of this area of investigation, however, is no excuse for ignoring sound experimental procedures.

The average life span in this country has increased considerably in the last half century, resulting in an increasing segment of our population at the upper end of the age continuum who present an economic as well as a social problem. Factual information about this age group is still meager. As individuals they present many problems, feelings, and difficulties which are more or less distinctive or are at least emphasized by age. Our techniques and research procedures must, therefore, be flexible and modified to meet these needs. Extensive research is needed not just on the aged themselves but, most pressingly, on techniques and tools which are standardized on and intended for use with older subjects. While the difficulties are considerable, subjects for investigation must be recruited from the ranks of the non-hospitalized, non-psychiatric aged, who, despite their advanced years, are still maintaining independent function. Longitudinal studies, which in the final analysis will demonstrate intra-individual age changes, are sorely needed. Many of the newer methods such as self-sorts (16, 24) which are devised for the study of the individual case, and the statistical methods devised for clinical use (25) seem particularly promising for this area. Utilization of such tools can lead to the evolution of valid theories, which as Watson (27, 28) has indicated are quite lacking and sorely needed in this area and have been neglected in the attempt to answer some of the questions raised by the increasing pressure and demands of a purely service orientation.

SUMMARY

While there is considerable literature available regarding the psychiatric and psychologic changes occurring with advanced age, little agreement exists as to what these changes are or what they mean. A priori, it is often assumed that aging is accompanied by measurable and meaningful mental deterioration, and this negative assumption is the starting point for much of the research in gerontology. An examination of the literature reveals that most information has been obtained from senile inmates of mental institutions and homes for the aged and that the findings from such studies have been generalized to the aged at large. From the standpoint of scientific methodology and control, gerontologic research has lagged behind in terms of uncritical use of unstandardized tools and tests, poor sampling procedures, and failure to control pertinent variables which may have far more influence on the experimental findings than age per se.

Various aspects of gerontologic research have been discussed, shortcomings noted, and some suggestions made for improvement in future experimental designs and planning.

REFERENCES

1. Ames, L. B., Learned, J., Metroux, R. W., Walker, R. N.: *Rorschach Responses in Old Age.* Hoeber-Harper, New York, 1954.
2. Balinsky, B.: An Analysis of the Mental Factors of Various Age Groups from Nine to Sixty. *Genet. Psychol. Monogr., 23:* 191-234, 1941.
3. Barker, L. F.: Physical Changes in Old Age and their Effects upon Mental Attitudes. In: G. Lawton (Ed.), *New Goals for Old Age.* Columbia University Press, New York, 1943.
4. Bayley, N., and Oden, M. H.: The Maintenance of Intellectual Ability in Gifted Adults. *J. Gerontol., 10:* 91-107, 1955.
5. Boice, M. L., Tinker, M. A., and Paterson, D. G.: Color Vision and Age. *Am. J. Psychol., 61:* 520-526, 1948.
6. Caldwell, B. McD.: The Use of the Rorschach in Personality Research with the Aged. *J. Gerontol., 9:* 316-323, 1954.
7. Davidson, H. H., and Kruglow, L.: Personality Characteristics of the Institutionalized Aged. *J. Consult. Psychol., 16:* 5-12, 1952.
8. Dennis, W.: Cultural and Developmental Factors in Perception. In: R. R. Blake and G. V. Ramsey (Eds.), *Perception—An Approach to Personality.* Ronald Press, New York, 1951.
9. Dennis, W.: *Age and Behavior: A Survey of the Literature.* USAF School of Aviation Medicine Project No. 21-0202-007, Report No. 1, 1953.
10. Havighurst, R. J.: Problems of Sampling and Interviewing in Studies of Old People. *J. Gerontol., 5:* 158-167, 1950.
11. Howell, R. J.: Changes in Wechsler Subtest Scores with Age. *J. Consult. Psychol., 19:* 47-50, 1955.

12. Kleemeier, R. W.: The Relationship Between Orth-Rater Tests of Acuity and Color Vision in a Senescent Group. *J. Appl. Psychol., 36:* 114-116, 1952.
13. Klopfer, W. G.: Personality Patterns of Old Age. *Rorschach Res. Exch., 10:* 145-166, 1946.
14. Mason, E. P.: Some Correlates of Self-Judgments of the Aged. *J. Gerontol., 9:* 324-337, 1954.
15. Mason, E. P.: Some Factors in Self-Judgments. *J. Clin. Psychol., 10:* 336-340, 1954.
16. Mowrer, O. H.: *Psychotherapy.* Ronald Press, New York, 1953.
17. Noyes, A. P.: *Modern Clinical Psychiatry.* W. B. Saunders, Philadelphia, 1953.
18. Obrist, W. D.: Simple Auditory Reaction Time in Aged Adults. *J. Psychol., 35:* 259-266, 1953.
19. Peterson, R. L.: Older Workers and Their Job Effectiveness. *Geriatrics, 10:* 34-38, 1955.
20. Prados, M., and Fried, E.: Personality Structure in the Older Age Groups. *J. Clin. Psychol., 3:* 113-120, 1947.
21. Sands, S. L., and Rothschild, D.: Sociopsychiatric Foundations for a Theory of the Reactions to Aging. *J. Nerv. & Ment. Dis., 116:* 233-241, 1952.
22. Schaie, K. W., Rosenthal, F., and Perlman, R. M.: Differential Mental Deterioration of Factorially "Pure" Functions in Later Maturity. *J. Gerontol., 8:* 191-196, 1953.
23. Shock, N. W.: Gerontology. In: C. P. Stone (Ed.) *Annual Review of Psychology.* Vol. 2, Annual Reviews, Inc., Stanford, Calif. 1951.
24. Stephenson, W.: *The Study of Behavior.* University of Chicago Press, Chicago, 1953.
25. Symposium: Statistics for the Clinician. *J. Clin. Psychol.,* 6: 1-76, 1950.
26. Tiffin, J.: *Industrial Psychology.* (2nd Ed.) Prentice-Hall, New York, 1947.
27. Watson, R. I.: Historical Perspectives on Psychological Work in Gerontology in the United States. Paper read at the International Congress on Gerontology, London, 1954.
28. Watson, R. I.: The Personality of the Aged: A Review. *J. Gerontol., 9:* 309-315, 1954.
29. Wechsler, D.: *The Measurement of Adult Intelligence.* (3rd Ed.) Williams & Wilkins, Baltimore, 1944.
30. Wechsler, D.: *Wechsler Adult Intelligence Scale.* Psychological Corp., New York, 1955.

BOOK REVIEWS

EVALUATION IN MENTAL HEALTH, a review of the problem of evaluating mental health activities, report of the Subcommittee on Evaluation of Mental Health Activities, Community Services Committee, National Advisory Mental Health Council, National Institute of Mental Health, U. S. Department of Health, Education and Welfare, Public Health Service publication No. 413, Government Printing Office, Washington, D. C., 1955, 292 pages $2.00.

The first 60 pages present a keen and challenging analysis of the status of evaluation of programs in the field of mental health. The report concerns itself predominantly with the measurement of accomplishment in mental health programs, although some consideration is also given to measurement of need and to assessment of methods of measurement. The bulk of the book consists of abstracts of 984 projects or published papers in the field of mental hygiene. While relatively few of the references deal with mental hygiene of older people, the introductory discussion of evaluation in the field of mental hygiene is useful for anyone who is planning research on the mental health of adults or of old people.

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MORBIDITY IN THE MUNICIPAL HOSPITALS OF THE CITY OF NEW YORK, report of an exploratory study in hospital morbidity reporting, by Marta Fraenkel and Carl L. Erhardt, Russell Sage Foundation, New York 1955, 229 pages, $4.50.

Data on specific morbidity, the state of being afflicted with a specific disease, are essential to planners and administrators of medical, hospital, and public health programs. Heretofore information on morbidity has been derived from mortality statistics, mandatory reporting of certain diseases by physicians, and special health surveys, each of which has limitations.

In an attempt to close at least part of this gap of morbidity knowledge, the authors, who are directors of the statistical services of the Department of Hospitals and the Department of Health, conducted a pilot study of over 120,000 patients discharged from 31 general and special hospitals in the New York municipal hospital system during a six month period in 1952.

Demographic and diagnostic information, as well as length of stay, type of surgical intervention, and outcome on discharge were recorded on a special report form from the patients' charts. The tabulated data form the basis of numerous tables by diagnostic categories, by sex, color, and age, by condition on discharge and length of hospital stay. Fifty-six of these tables are published and explained in the text.

Recognizing the limitations of hospital morbidity reporting and the weaknesses of a pilot study confined to the municipal hospitals of a large city caring almost exclusively for the indigent group, the authors advance arguments to support their thesis that hospital morbidity data are valuable in public health administration, community planning for medical care, and hospital administration.

They recommend gradual development of a permanent city-wide hospital morbidity reporting system, to include ultimately voluntary and proprietary as well as municipal hospitals in New York.

DAVID LITTAUER, M.D.,
Executive Director
Jewish Hospital of St. Louis

BOOKS RECEIVED

Books received since May 1 are acknowledged in the following list:

Aging and Retirement, a report on the Fifth Annual Southern Conference on Gerontology held at the University of Florida, December 28-30, 1954, University of Florida Press, Gainesville, 1955, 142 pages, paper bound, $2.00.

Evaluation in Mental Health, a review of the problem of evaluating mental health activities, report of the Subcommittee on Evaluation of Mental Health Activities, Community Services Committee, National Advisory Mental Health Council, National Institute of Mental Health, U. S. Department of Health, Education, and Welfare, Public Health Service publication No. 413, Government Printing Office, Washington, D. C., 1955, 292 pages, $2.00 per copy; a discount of 25 per cent will be allowed on all orders for 100 or more copies to be mailed to one address (reviewed in this issue, page 457).

La Gerocultura, Especialidad Nueva de la Sanidad Nacional, su estudio, necesidad y organización, by Gonzalo Piédrola Gil, Gráficas González, Madrid, 1955, 86 pages, paper bound.

Morbidity in the Municipal Hospitals of the City of New York, report of an exploratory study in hospital morbidity reporting, by Marta Fraenkel and Carl L. Erhardt, the Russell Sage Foundation, New York, 1955, 229 pages, $4.50 (reviewed in this issue, page 457).

Social Problems, edited by T. Lynn Smith, Chapter 4 (pp. 96-123): Problems of Aging and the Aged, by Irving L. Webber, Thomas Y. Crowell Co., New York, 1955, 517 pages, $4.75.

The Field of Social Work, 3rd ed., by Arthur E. Fink, Everett E. Wilson, and Merrill B. Conover, Chapter 13 (pp. 435-477): Social Services for the Aged, Henry Holt and Company, New York, 1955, 629 pages, $5.25.

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VOLUME 10, SECTION C OCTOBER, 1955 NUMBER 4

ORGANIZATION SECTION

President Ollie A. Randall (New York) Past President Anton J. Carlson (Chicago)
President-elect William B. Kountz (St. Louis) Treasurer John Esben Kirk (St. Louis)
Secretary Nathan W. Shock (Baltimore)

Program of the Eighth Annual Scientific Meeting of the Gerontological Society, Inc.

October 27-29, 1955

SHERATON-BELVEDERE HOTEL
Baltimore, Maryland

F. D. ZEMAN, *General Program Chairman*
H. SEIDEL, *Local Arrangements Committee Chairman*
J. A. HAMILTON, Section on Biological Sciences
A. A. HELLBAUM, Section on Clinical Medicine
WILMA T. DONAHUE, Section on Psychological and Social Sciences
J. WEIL, Section on Social Work and Administration

THURSDAY, OCTOBER 27

8:30-9:30 a.m., Registration

Morning Session, 10:00 a.m. - 12:30 p.m.—Charles Room

General Session: Basic Considerations—Medical and Social Problems of the Aging and the Aged

Chairman: F. D. ZEMAN, Chief, Medical Services
Home for Aged and Infirm Hebrews, New York

RANDALL, OLLIE A.—(Community Service Society, New York; President of the Gerontological Society). Opening Remarks.

DEARDORFF, NEVA—(Health Insurance Plan New York). Statistical Background.

STEBBINS, E.—(Director, Johns Hopkins University, School of Hygiene and Public Health, Baltimore). Public Health Problems.

MONROE, R.—(Director, Geriatric Clinic, Peter Bent Brigham Hospital, Boston). The Physician's Responsibility.

SCOTTLAND, C.—(Commissioner, Social Security, Department of Health, Education, and Welfare, Washington, D. C.). Social and Economic Problems.

ODELL, C. E.—(Coordinator, Projects for Older Workers, U. S. Department of Labor, Washington, D. C.). Employment and Employability.

12:30-2:00 p.m., Separate Luncheon Meetings for each Professional Section and the General Member Section of the Society

($3.00 per plate. Tickets to be obtained on registration. Location of luncheon meetings will be posted at Registration Desk.)

Afternoon Sessions, 2:00-4:30 p. m.—Simultaneous Section Meetings

Section on Biological Sciences—Room 222

Chairman: J. A. HAMILTON, Stanford University School of Medicine, Stanford, California

SODERWALL, A. L., and BRITENBAKER, A. L.—(Department of Animal Husbandry, Cornell University, Ithaca). Reproductive Capacities of Different Age Hamsters (*Cricetus auratus*, Waterhouse).

BERG, B. N.—(College of Physicians and Surgeons, Columbia University, New York). Muscular Dystrophy in Aging Rats.

SILVERSTONE, F. A., BRANDFONBRENER, M., SHOCK, N. W., and YIENGST, M. J.—(Section on Gerontology, National Heart Institute, Bethesda, and the Baltimore City Hospitals, Baltimore). Age Differences in Glucose Tolerance and the Response to Insulin.

RUDZINSKA, MARIA A.—(Rockefeller Institute for Medical Research, New York). Differences Between Young and Old Organisms in *Tokophyra infusionum*.

SØRENSEN, L. B., and KIRK, J. E.—(Division of Gerontology, Washington University School of Medicine, St. Louis). The Effect of Age on the Fumarase Activity of the Human Aorta and Pulmonary Artery.

ANDREW, W.—(Department of Anatomy, Bowman Gray School of Medicine, Winston-Salem, North Carolina). A Comparison of Age Changes in the Kidney of the Rat and of Man.

MARRAZZI, A. S., and HART, E. R.—(Clinical Research Division and Neurology Branch, Chemical Corps Medical Laboratories, Army Chemical Center, Maryland). The Nature and Action of the Tranquilizing Drugs.

PARFENTJEV, I. A.—(Department of Microbiology, Yale Unversity School of Medicine, New Haven). Age and Susceptibility to Infections in Mice.

BJORKSTEN, J., and GOTTLIEB, H.—(Bjorksten Research Foundation, Madison, Wisconsin). A Common Molecular Basis for the Aging Syndrome.

Section on Clinical Medicine: Everyday Problems in the Care of the Elderly
(meeting to be held jointly with the Maryland Academy of General Practice)

Red Room

Chairman: L. KRAUSE, Professor of Medicine, University of Maryland School of Medicine, Baltimore

ZEMAN, F. D.—(Chief, Medical Services, Home for Aged and Infirm Hebrews, New York). General Therapeutic Considerations.

EDWARDS, C. R.—(Professor of Surgery, University of Maryland School of Medicine, Baltimore). Surgery in the Aged.

FINESINGER, J.—(Professor of Psychiatry, University of Maryland School of Medicine, Baltimore). Aspects of Psychiatry.

FERDERBER, M.—(Assistant Professor of Medicine, University of Pittsburgh). Rehabilitation.

Section on Psychological and Social Sciences—Room 218

Presented by the National Institute of Mental Health

Chairman: J. E. BIRREN, Chairman, Research Committee on Aging, National Institute of Mental Health, Bethesda

Panel: The Extramural Program

SAPIR, P.—(Chief, Research Grants and Fellowships Branch, N.I.M.H., Bethesda). The Place of Aging in Grants and Fellowships.

WILLIAMS, R.—(Sociologist, Professional Services Branch, N.I.M.H., Bethesda). Special Projects of the Professional Services Branch.

KRAMER, M.—(Chief, Biometrics Branch, N.I.M.H., Bethesda). Gerontologic Problems of Mental Hospital Populations.

HALPERT, H.—(Chief, Publications and Reports Section, N.I.M.H., Bethesda). Information Services on Mental Health Problems of Later Life.

Panel: The Intramural Program

KETY, S.—(Associate Director in Charge of Research, N.I.M.H. and N.I.N.D.B., Bethesda). Age Changes in Cerebral Metabolism and Circulation.

STREICHER, E.—(Psychologist, Section on Aging, N.I. M. H., Bethesda). Research Activities of the Section on Aging.

PERLIN, S.—(Psychiatrist, Clinical Investigation, N.I.M.H., Bethesda). Psychiatric Evaluation of the Elderly with Emphasis on Depressive States.

Section on Social Work and Administration: General Aspects of Growing Old—Blue Room

Chairman: J. WEIL, Executive Director, The Montefiore Home, Cleveland Heights

BOTWINICK, J.—(Section on Aging, Laboratory of Psychology, National Institute of Mental Health, D.H.E. & W., Bethesda). Principles and Concepts in the Psychologic Aspects of Aging.

LINDEN, M.—(Director, Division of Mental Health, Philadelphia Department of Public Health; Regional Director Commonwealth Mental Health Center, Philadelphia). Psychiatric Elements in Aging.

FRAENKEL, MARTA—(Assistant to the Commissioner, Department of Hospitals, New York). Medical Elements in Aging.

HUNDLEY, J. M.—(National Institute of Arthritis and Metabolic Diseases, Bethesda). Nutritional Elements in Aging.

GOODMAN, J. I.—(Medical Director, County Nursing Home, Cleveland). Observations on Nutrition in the Aging.

4:30-6:00 p. m. Visits to institutions in Baltimore will be arranged for those who have special interests.

(See Registration Desk)

Evening Session, 8:30 p. m., Reception for the members of the Gerontological Society by the Medical Chirurgical Faculty of the State of Maryland and the Baltimore City Medical Society

Chairman: G. H. YEAGER, President
Medical Chirurgical Faculty of the State of Maryland, Baltimore

Greetings: A. R. KOONTZ, President, Baltimore City Medical Society
OLLIE A. RANDALL, President, Gerontological Society, Inc.
W. S. STONE, Dean, University of Maryland School of Medicine
P. BARD, Dean, Johns Hopkins University School of Medicine

Address: Education for Gerontology, F. C. SWARTZ, East Lansing, Michigan

Following the program refreshments will be served by the Ladies Auxiliary of the Medical Chirurgical Faculty and the Baltimore City Medical Society.

FRIDAY, OCTOBER 28

Morning Session, 9:00 a.m. - 12:00 noon—Charles Room

General Session: Whither Gerontology? Current Research Needs

Chairman: E. L. BORTZ, Philadelphia

LANSING, A. I.—(Professor of Anatomy, Emory University, Atlanta). Biology.

DONAHUE, WILMA T.—(Institute for Human Adjustment, University of Michigan, Ann Arbor). Psychology.

HOBBS, G. W.—(Chairman, National Committee on Aging of the National Social Welfare Assembly; Vice-President, First National City Bank of New York). Social Sciences.

FREEMAN, J. T.—(Philadelphia). Clinical Medicine.

LORGE, I.—(Professor of Educational Psychology, Teachers College, Columbia University, New York). Prospects for the Future.

12:00 p. m., Luncheon Meeting, Council of the Gerontological Society, Inc.—Room 220

Afternoon Sessions, 2:00-4:30 p. m., Simultaneous Section Meetings

Section on Biological Sciences—Room 222

Chairman: M. LANDOWNE, Baltimore City Hospitals, Baltimore

GOLDBLOOM, A. A., EIBER, H. B., and DANISHEFSKY, I.—(New York Medical College, Metropolitan Medical Center, Bird S. Coler Hospital Division, New York). Newer Clinical and Laboratory Studies in the Aged. XI. Chemical Studies of the 80-100 Year Old Group.

GEY, G. O.—(Department of Surgery, Johns Hopkins University School of Medicine, Baltimore). Cellular Growth Responses in Relation to Age.

ROGERS, J. B., and TAYLOR, R. C.—(Department of Anatomy and Department of Pathology, University of Louisville School of Medicine). Pathology and Behavior of Senile Guinea Pigs.

ROCKSTEIN, M.—(Assistant Professor of Physiology, New York University, New York). Some Biochemical Aspects of Aging in Insects.

SONNEBORN, T. M.—(Department of Zoology, Indiana University, Bloomington). Inheritance of Effects of Parental Age in *Paramecium*.

SULKIN, N. M.—(Department of Anatomy, Bowman Gray School of Medicine, Winston-Salem, North Carolina). Mucoprotein in Nerve Cells of the Dog and Its Alterations During Aging.

ALBANESE, A. A., HIGGONS, R. A., ORTO, LOUISE, ZAVATTARO, DOROTHY M., MALONEY, MARY O., and ROSENQUEST, MURIEL E.—St. Luke's Convalescent Hospital, Greenwich, Connecticut). Dietary and Metabolic Inter-Relationships in the Aged.

CHARRIPER, H. A.—(Department of Biology, New York University, New York). Studies of Effects of Aging on the Adrenal and Pituitary Glands of the Golden Hamster.

Section on Clinical Medicine: Old Age and Chronic Illness
(meeting to be held jointly with the Commission on Chronic Illness)

Red Room

Chairman: D. W. ROBERTS, Executive Director
Commission on Chronic Illness, Baltimore

TAYBACK, M.—(Director, Statistical Section, Baltimore City Health Department). Variations in the Prevalence of Chronic Illness and Disability in Different Age Groups.

WATERHOUSE, ALICE—(Division of Public Health Methods, Department of Health, Education, and Welfare, Washington, D. C.). Assessing the Home Care Program for the Aged Chronically Ill.

FREEMAN, RUTH—(Associate Professor of Public Health, Johns Hopkins University School of Hygiene, Baltimore). Making Bedside Nursing Care Available to the Patient at Home.

COLEMAN, J. B.—(Vice-President, Johns Hopkins University, Baltimore). The Function of the General Hospital in the Care of the Long-Term Patient.

LEWIS, W. H., JR.—(Assistant Attending Physician, Memorial Center for Cancer, New York). Impact of Chronic Illness on Practice of Medicine.

Read by Title:

SEIDEL, J., GUZMAN, M. F., and HORSMAN, R. K.—(Veterans Administration Hospital, Kerrville, Texas). Congenital Hemolytic Anemia Treated at the Age of Sixty.

Section on Psychological and Social Sciences—Room 218

Symposium: Patterns of Personal and Social Adjustment in Aging in Retrospect and Prospect

Chairman: M. E. LINDEN, Director, Division of Mental Health, Department of Public Health, Philadelphia

VON MERING, O.—(Department of Anthropology, University of Pittsburgh). Comparative Gerontologic Aspects of Human Cultures.

ALBRECHT, RUTH—(Department of Home Economics, Alabama Polytechnic Institute, Auburn). Metamorphosis of the Family in the Human Life Cycle.

TUCKMAN, J.—(Division of Mental Health, Philadelphia Department of Health, Philadelphia). The Self-Image in Aging.

KLEEMEIER, R.—(Moosehaven Research Laboratory, Orange Park, Florida). Group Living as Prophylaxis and Treatment.

GOLDFARB, A. I.—(Home for the Aged and Infirm Hebrews of New York, New York). Rationale for Psychotherapy with Older Persons.

Section on Social Work and Administration: Care of the Mental Abnormalities In the Elderly—Blue Room

Chairman: GEORGIA MCCOY, Department of Health, Education, and Welfare, Washington, D. C.

MATHIASEN, GENEVA—(Secretary, National Committee on Aging, National Social Welfare Assembly, New York). Standards of Sheltered Care.

Methods of Treatment:

DASCO, M.—(Medical Director, Goldwater Memorial Hospital, New York). Medical and Rehabilitation Services.

FOLKOFF, J. P.—(Executive Director, Levindale Hebrew Home and Infirmary, Baltimore). Psychiatric Nursing.

GOLD, J.—(Executive Director, Orthodox Jewish Home for the Aged, Chicago). Care of the Senile in the Institution and in the Community.

LANDAU, GERTRUDE—(Executive Director, William Hodson Community Center, New York). Social Activities.

BOWEN, GEORGENE—(Director, Education-Recreation for Older People, Health and Welfare Council, Philadephia). Recreation for the Aged in Different Cultures.

SALAMONE, A.—(Director, Adult Education Center, St. Louis University, St. Louis). A Good Adjustment.

4:30-5:30 p.m., Business Meeting of the Gerontological Society, Inc.—Red Room

Chairman: OLLIE A. RANDALL, New York

6:30-9:30 p. m., Annual Dinner, Hotel Sheraton-Belvedere—Charles Room

($5.00 per Plate. Tickets at Registration Desk)

Chairman: H. SEIDEL, Baltimore

Addresses: THE HONORABLE THOMAS D'ALESSANDRO, Mayor of Baltimore
THE HONORABLE THEODORE MCKELDIN, Governor of Maryland
MISS OLLIE A. RANDALL, Presidential Address
JUDGE THOMAS J. S. WAXTER, Director, Maryland State Department of Public Welfare.—Maryland Faces the Problem of the Aged.

Showing of New Films: 1) A Place to Live
2) Geriatric Rehabilitation

SATURDAY, OCTOBER 29

Morning Sessions, 9:00 a. m. - 12:00 noon—Simultaneous Section Meetings

Section on Biological Sciences—Room 222

Chairman: J. A. ROGERS, Department of Anatomy, University of Louisville School of Medicine, Louisville

ACKERMANN, P. G., TORO, G., and KOUNTZ, W. B.—(Division of Gerontology, Washington University School of Medicine, St. Louis). Thyroid Activity in Elderly Individuals as Indicated by Radioiodine Uptake and Other Studies.

KLEEMEIER, R. W., RICH, T. A. and JUSTISS, W. A.—(Moosehaven Research Laboratory, Orange Park, Florida). The Effects of Alpha-2-piperdyl Benzhydrol Hydrochloride (Meratran) on Psychomotor Performance in a Group of Aged Males.

POPE, F., LUNSFORD, WANDA, and MCCAY, C. M.—(Agricultural Experiment Station, Cornell University, Ithaca). Attempts at Parabiotic Union Between Hamsters of the Same Age and Between Young and Middle-Aged Rats.

DURY, A.—(Dorn Laboratory for Medical Research, Bradford Hospital, Bradford, Pennsylvania). Immediate Effects of Growth Hormone and Epinephine on the Lipid Partition and Phospholipid Turnover in Plasma, Liver, and Aorta of Rabbits.

PAPEZ, J. W.—(Laboratory for Biological Research, Columbus State Hospital, Division of Mental Hygiene and Correction, Columbus, Ohio). Some Factors Related to Senile Changes in the Brain.

GREENBLATT, I. J., and LETTINE, J.—(Messinger Research Laboratory, Beth-El Hospital, Brooklyn). The Fall in Human Sera Lipids Following Ethionine Ingestion.

WOLFFE, J. B., PRAESENT, K., and CRISTNER, NANCY—(Valley Forge Heart Institute and Hospital, Fairview Village, Pennsylvania, and Wolffe Clinic, Philadelphia). Hyperplasia of the Suprarenal Glands and Kidneys Experimentally Induced by a Fraction of a Renal Extract. A Preliminary Report.

COMMONS, R. R.—(University of California School of Medicine, Los Angeles). The Effect of Thyroxine on Serum Protein Bound Iodine.

Section on Clinical Medicine

Medical Grand Rounds, with Dr. McG. Harvey, Professor of Medicine, Johns Hopkins University School of Medicine

10:00 a.m.—Hurd Hall

Section on Psychological and Social Sciences: Research and Methodology—Room 218

Chairman: WILMA T. DONAHUE, Chairman, Division of Gerontology, Institute of Human Adjustment, University of Michigan, Ann Arbor

BRADSHAW, H.—(Department of Psychology, Ohio State University, Columbus). Differentia of Superior as Contrasted to Problem Old People.

ALDRIDGE, G. J.—(Michigan State University, East Lansing). The Role of Older People in a Florida Retirement Community.

VERNIER, CLAIRE M.—(Veterans Administration Center, Martinsburg, West Virginia). Comparative Analysis of Personality Factors in a Geriatric Group Associated with Return to Community Living Versus Continued Residence in a Sheltered Institutional Setting.

WALLACE, W. L.—(The Psychological Corporation, New York). How the Wechsler Adult Intelligence Scale Was Standardized for Older Persons.

BUSSE, E. W.—BARNES, R. H., and COHEN, L. D. (Department of Psychiatry, Duke University, Durham, North Carolina). The Effects of Variables of Subjects and Methods in Gerontologic Research.

BOTWINICK, J.—BRINLEY, J. F., and BIRREN, J. E. (National Institute of Mental Health, Bethesda). Age Differences in Reaction Time Readiness.

OBRIST, W. D.—and HENRY, C. E.—(Institute of Living, Hartford, Connecticut). The Relation of EEG to Brain Syndrome in Aged Patients.

REALS, W. H.—(Professor of Adult Education, Washington University, St. Louis). What It Is Like to Be Old.

KUHLEN, R. G.—(Department of Psychology, Syracuse University, Syracuse). Adult Age Trends in Attitudes.

PRESSEY, S. L.—(Department of Psychology, Ohio State University, Columbus). Types of Work Older People Can Do Best.

Read by Title:

ANDRUS, RUTH, and BENJAMIN, R.—(Cold Spring Institute, Cold - Spring - On - Hudson, New York). Evidence of Change and Growth in Older People: A Report on the First Two Groups at the Cold Spring Institute.

Section on Social Work and Administration: The Role of Welfare Agencies in Providing Services to the Aged—Blue Room

Chairman: C. TIBBITTS, Committee on Aging, Department of Health, Education, and Welfare, Washington, D. C.

ABRAMS, A. J.—(Director, New York State Joint Legislative Committee on Problems of the Aging, Newburg). The Congress of the United States and Our Aged.

The Role of the Public Agency:

COHEN, W.—(Department of Health, Education, and Welfare, Washington, D. C.).

ROBINSON, H.—(Director, Public Welfare, State of Ohio, Columbus).

WAXTER, T. J. S.—(Director, Maryland State Department of Public Welfare, Baltimore).

GREVE, BELL—(City Welfare Director, Cleveland).

LEVINE, H.—(Consultant, Department of Public Welfare, City of New York). Mental Health and the Public Agency.

The Role of the Private Agency:

ZELDITCH, M.—(Director, Social Planning Department, Council of Jewish Federations and Welfare Funds, New York).

12:00 noon - 2:30 p. m., Closing Luncheon: Summary of Meetings by Section Chairman—Jubilee Room

($3.00 per plate. Reservations to be made at Registration Desk.)

Program Committee, Eighth Annual Scientific Meeting:

DR. F. D. ZEMAN, *Chairman*, New York.
DR. J. A. HAMILTON, *Biological Sciences*, Stanford University School of Medicine, Stanford, California.
DR. A. A. HELLBAUM, *Clinical Medicine*, University of Oklahoma School of Medicine, Oklahoma City.
DR. WILMA T. DONAHUE, *Psychological and Social Sciences*, University of Michigan, Ann Arbor.
DR. J. WEIL, *Social Work and Administration*, Cleveland.
DR. O. J. KAPLAN, *General Members*, San Diego State College, San Diego.
DR. I. LORGE, *General Sessions*, Teachers College, Columbia University, New York.
DR. W. C. MCKAIN, JR., *General Sessions*, University of Connecticut, Storrs.

Local Arrangements Committee, Eighth Annual Scientific Meeting:

DR. H. SEIDEL, *Chairman*, Baltimore.
MISS ESTHER LAZARUS, City Director, Public Welfare Department, Baltimore.
JUDGE T. J. S. WAXTER, State Director, Welfare Department, Baltimore.
MR. G. MANSER, Executive Secretary, Council of Social Agencies, Baltimore.
MR. D. L. B. FRINGER, State Director, Department of Employment Security, Baltimore.
DR. H. WILLIAMS, Commissioner of Health, Baltimore City Health Department, Baltimore.
MISS FRANCES MORTON, Executive Director, Citizens Planning and Housing Association, Baltimore.
MR. H. FROELICHER, Citizens Planning and Housing Association, Baltimore.
MR. E. J. LIPITZ, Secretary, Nursing Homes Association of Maryland, Catonsville.
MR. R. WILSON, President, Kenesaw Rest Home, Baltimore.
MR. H. G. FRITZ, Chief, State Department of Health, Division of Hospital Services, Baltimore.
DR. D. ROBERTS, Director, Commission on Chronic Illness, Baltimore.
DR. P. BARD, Dean, Johns Hopkins University School of Medicine, Baltimore.
DR. W. M. WING, Associate Professor, Public Health Administration, Johns Hopkins University School of Hygiene and Public Health, Baltimore.
DR. J. E. MOORE, Associate Professor of Medicine, Johns Hopkins University School of Medicine, Baltimore.
DR. B. F. CHOW, Associate Professor of Biochemistry, Johns Hopkins University School of Hygiene and Public Health, Baltimore.
DR. W. S. STONE, Dean, University of Maryland Medical School, Baltimore.
DR. J. C. KRANTZ, JR., Professor of Pharmacology, University of Maryland School of Medicine, Baltimore.
DR. W. R. AMBERSON, Chairman, Department of Physiology, University of Maryland School of Medicine, Baltimore.
DR. G. H. YEAGER, President, Medical and Chirurgical Faculty of the State of Maryland, Baltimore.
DR. A. R. KOONTZ, President, Baltimore City Medical Society.
MR. R. BALL, Deputy Director, Old Age and Survivors Insurance, Baltimore.
MISS NEOTA LARSON, Chief, Program Planning, Department of Health, Education, and Welfare, Baltimore.
DR. W. L. FLECK, Manager, Veterans Hospital, Baltimore.

Local Arrangements Committee, Members at Large:

DR. L. KRAUSE, Professor of Medicine, University of Maryland, School of Medicine, Baltimore.
MR. T. A. VANSANT, Director, Adult Education, Baltimore.
MR. J. FOLKOFF, Executive Director, Levindale-Hebrew Home and Infirmary, Baltimore.
MRS. MILDRED ATKINSON, Executive Secretary, Federation of Churches, Baltimore.
FATHER WISE, Loyola College, Baltimore.
MR. J. P. MCMILLAN, Executive Director, Baltimore City Hospitals, Baltimore.

Abstracts of Papers

Section on Biological Sciences

Thyroid Activity in Elderly Individuals as Indicated by Radioiodine Uptake and Other Studies.

P. G. ACKERMANN, G. TORO, AND W. B. KOUNTZ, *Division of Gerontology, Washington University, School of Medicine, St. Louis, Missouri.*

Radioiodine uptake studies were made on more than 200 individuals, most of them over the age of 50; basal metabolic rate and serum cholesterol determinations were also made. The correlation of these data with the age and health of the patient will be described.

Dietary and Metabolic Inter-Relationships in the Aged.

A. A. ALBANESE, R. A. HIGGONS, LOUISE ORTO, DOROTHY N. ZAVATTARO, MARY O. MALONEY, AND MURIEL E. ROSENQUEST, *Nutritional Research Laboratory, St. Luke's Hospital, New York, New York, St. Luke's Convalescent Hospital, Greenwich, Connecticut, and Miriam Osborn Memorial Home, Rye, New York.*

Serial studies on 192 aged women (69-95 years) over a period of 5 years disclosed that their average daily caloric intake is 1895 ± 102. The percentile caloric distribution on a self-selected regimen is: proteins, 14; carbohydrate, 45; and fat, 41. On this diet little or no changes in body weight were noted. The hemoglobin and plasma protein levels initially were in the normal range and remained so during the course of the study. Electrophoretic measurements of the plasmas of 150 of the women showed relatively normal A/G ratios, with some diminution of the alpha, and alpha$_2$ globulins. Despite the somewhat higher intake of fat calories the blood cholesterol levels of this group fell well within the accepted norms. Positive nitrogen balances were maintained by these women on daily intakes of 47 to 63 Gm. of protein. However, when daily caloric intake was reduced below 1300, negative nitrogen balances developed on a daily protein intake of less than 50 Gm. Examination of individual records failed to disclose any significant reduction in metabolic rate or nutrient requirements over the 5 year period of study.

A Comparison of Age Changes in the Kidney of the Rat and of Man.*

W. ANDREW, *Department of Anatomy, Bowman Gray School of Medicine, Winston-Salem, North Carolina.*

Histologic study of senile human kidneys has in general verified the changes accepted as occurring in man in old age in the "normal" involution of these organs. Such changes include extensive vascular alteration, particularly arteriolosclerosis, and elimination of the glomeruli by a process of fibrosis. The glomeruli thus affected are no longer *functioning* units but can be identified structurally. Some details of change in other parts of the human nephron are described. Parallel study of the kidney of the Wistar Institute rats shows much less evidence of fibrosis of glomeruli, although these structures take on a "senile aspect," with much thickened basement membranes. Vascular change is not marked in the senile rat kidney. Definite changes are seen in the various portions of the nephron, including specific cellular alterations. The question as to whether altered cells should be termed "oncocytes" is discussed. "Colloid" in the lumen of the tubules is found in 100 per cent of the kidneys of senile rats examined.

Muscular Dystrophy in Aging Rats.

B. N. BERG, *College of Physicians and Surgeons, Columbia University, New York, New York.*

With advancing age rats develop a form of muscular dystrophy that is the chief contributory cause of death in senescence. The disease is ushered in by hind leg weakness and a straddling gait. The flank muscles become atrophied and within 6 weeks to 8 weeks after the onset of symptoms the hind limbs are paralyzed. Microscopically the striated muscles (gastrocnemius and adductor) show varying degrees of degeneration and necrosis. Evidence of regeneration is also present.

The symptoms and histologic findings are similar to those observed in vitamin E-deficient rats. However, the animals are kept on a diet consisting of Rockland 'D free' pellets which contain 3.2 mg. alpha tocopherol, a supplement adequate for excellent growth and fertility. The dystrophy appears earlier in males (700 days) than in females (800 days). From 800 to 900 days of age, 83 per cent of males and 27 per cent of females develop muscle lesions, while in rats over 1,000 days old the disease is found in 100 per cent of animals of both sexes.

Experiments are under way to determine whether the muscular dystrophy of aging rats is related to a vitamin E deficiency despite an amount in the diet considered to be adequate according to current bioassay standards. It is possible that the requirements for maintaining the integrity of striated muscle increase with age.

A Common Molecular Basis for the Aging Syndrome.

J. BJORKSTEN and H. GOTTLIEB, *Bjorksten Research Foundation, Madison, Wisconsin.*

A satisfactory scientific definition of aging has not been accepted because of the vast areas of biochemi-

*Part of a general program on age changes sponsored by the Wistar Institute of Anatomy under the Executive Director, Dr. Edmond J. Farris, and supported by the Samuel S. Fels Fund.

cal and physiologic knowledge still to be discovered and studied. Aging has many facets which influence individuals in apparently various manners. If a common cellular or molecular denominator could be found and demonstrated experimentally to be operative, many, if not all, of the apparently unrelated and variable manifestations presently ascribed to the aging syndrome could be more logically examined and possibly practical solutions achieved in the foreseeable future.

The progressive protein immobilization hypothesis has merit as a fundamental molecular denominator for aging. The consequence of such a mechanism can be predicted on a biochemical basis and tested by comparison with known or suspected physiologic and pathologic changes or symptoms.

The pathologic basis for the degenerative diseases resulting from the fundamental biochemical aspects of the hypothesis can be illustrated by the development of atherosclerosis. The physiologic consequences of atherosclerosis in the remainder of the body serves then as a cause of many other symptoms of the aging syndrome.

Immediate Effects of Growth Hormone and Epinephrine on the Lipid Partition and Phospholipid Turnover in Plasma, Liver, and Aorta of Rabbits.

A. Dury, *Dorn Laboratory for Medical Research, Bradford Hospital, Bradford, Pennsylvania.*

Because of the possibility that an altered lipid metabolism, particularly in the aorta, may be related to the pathogenesis of arteriosclerosis, it is essential that the nature and sites of influence of certain hormones on lipid metabolism be elucidated.

In the present study epinephrine in oil (1 mg./Kg. body weight) or growth hormone (5 mg./Kg.) was administered subcutaneously to groups of rabbits 6 hours before they were sacrificed. Two more groups received an equal volume of peanut oil or physiologic saline and served as controls for the epinephrine and growth hormone-treated rabbits, respectively. A dose of approximately 5 mc. radioactive phosphate (P^{32}) was given intravenously immediately after the hormone or placebo injection.

The lipid partition and phospholipid specific activities in liver, plasma, and aorta were determined. Epinephrine injection resulted in significantly elevated concentrations of plasma phospholipid and total lipid, ester cholesterol, and neutral fat in the liver. The concentrations of all aortic lipid fractions were not different from control values. Specific activities of the plasma, liver, and aorta phospholipids were significantly elevated. Of especial interest was the fact that the rate of aortic phospholipid turnover was 131 per cent greater than the controls while the turnover of liver phospholipids was greater only by 43 per cent.

Growth hormone injection resulted in significantly increased levels of all lipid fractions of plasma and liver. The greatest changes were found in the neutral fat fraction of liver and plasma, and the phospholipid, free and ester cholesterol fractions of plasma. On the other hand, the total lipid concentration in the aorta was significantly depressed; this primarily was due to a 25 per cent decrease in the neutral fat content from the control level. The P^{32} data in this group indicated that the rate of liver phospholipid turnover was probably significantly increased ($p=0.05$) while the turnover of plasma phospholipid was markedly increased (200 per cent). The aortic phospholipid specific activity was not different from the controls.

These findings indicate that one of the modes of immediate epinephrine influence upon lipid metabolism is an increased rate of phospholipid turnover in liver, plasma, and aorta, but only a moderate effect upon lipid mobilization. Growth hormone seemed to show an early marked effect upon lipid mobilization and only a moderate effect upon liver and plasma phospholipid synthesis. Moreover, in contrast to epinephrine's effect on aortic phospholipid turnover, there was no indication of such an action by growth hormone on this tissue site.

Newer Clinical and Laboratory Studies in the Aged. XI. Chemical Studies of the 80-100 Year Old Group.

A. A. Goldbloom, H. B. Eiber, and I. Danishefsky, *New York Medical College, Metropolitan Medical Center (Bird S. Coler Hospital Division), New York, New York.*

A 5-year study of 500 subjects aged 13 to 100 years, with emphasis on the 80-100 year age group (100 patients) will be reported. Blood lipids, ultracentrifuge lipoprotein determinations, paper electrophoresis will be correlated with clinical status, electrocardiograms, ballistocardiograms, and x-ray findings.

A "threshold" is found to occur in the 60-75 year group, following which there is a reversal of certain biochemical and/or physical processes.

Aided by a grant from the Sophie D. Cohen and William W. Cohen Foundation.

The Fall in Human Sera Lipids Following Ethionine Ingestion.

I. J. Greenblatt and J. Lettine, *Messinger Research Laboratory, Beth-El Hospital, Brooklyn, New York.*

Popper, and later Chaikoff, had shown that a decrease in the level of serum cholesterol and lipoproteins in the experimental animal occurs when fed ethionine. This interesting substance formerly held to be a toxic anti-metabolic, is now considered to exert its effects by acting as an anti-methionine agent.

Five volunteers, 3 males and 2 females in normal health were permitted their normal diets, except that dl-ethionine was ingested at a level of 6 to 9 Gm. per day, 2 to 3 Gm. three times a day.

Two control sera lipoproteins and cholesterol levels were taken and then the feeding of ethionine continued for 12 days. The drug was discontinued and blood samples were collected on the 19th and 28th day after the beginning of the experiment.

One female subject showed no definite changes in serum lipids. The other 4 subjects showed a varying, but sharp decline of their sera lipoproteins and cholesterol levels, which began to rise after cessation of the ingestion of the drug.

The Effects of Alpha-(2-Piperidyl Benzhydrol Hydrochloride (Meratran) on Psychomotor Performance in a Group of Aged Males.

R. W. KLEEMEIER, T. A. RICH, AND W. A. JUSTISS, *Moosehaven Research Laboratory, Orange Park, Florida.*

The effects of Meratran on the performance on a battery of 13 psychomotor tests were noted. Subjects were 22 male residents (average age 75.68) of a fraternal home for the aged. During the week preceeding the testing 2 mg. of Meratran were administered orally to each subject daily. On alternate weeks placebos were given as controls. The battery was given twice under the experimental condition and twice under the control condition. Included were tests of visual perception, sorting, tapping, verbal output, time estimation, figure drawing, and hand strength. Although there was a general tendency for increase in amount of production on the tests under the experimental condition, in only the last 3 tests did the group performance under the drug condition seem to be significantly altered.

Some Factors Related to Senile Changes in the Brain.

J. W. PAPEZ, *Laboratory for Biological Research, Columbus State Hospital, Division of Mental Hygiene and Correction, Columbus, Ohio.*

A gradual loss of some facile functions of the nervous system is common in old age. Neural functions such as reception, transmission, and retention are involved. Conditions associated with these functional deficits are found in nerve cells and blood vessels of the brain. Lipofuscin granules which occupy cytoplasm of nerve cells in the thalamus and cerebral cortex seem to be dead remains of primitive mycotic organisms which frequent the blood stream, walls of blood vessels, nerve cells, hypophysis cerebri, and adrenal glands. Their presence as originally living organisms was demonstrated in our laboratory in several hundred cases by phase microscopy at 970x magnification. These zoospores when motile enter the cytoplasm of nerve cells where they cause visible damage to neurofibrils. These latter act as tape recorders for nerve impulses conducted by a so-called fluid membrane along them. Disturbances of perception, memory, and disorientation, may be attributed to this damage. Actual destruction of nerve cells, more often of granule cells, is common in senile brain disease. A new crop or outbreak of mycotic zoospores is accompanied by nervous disturbances, often leading to psychosis, when severe. Another feature is gliosis, a metabolic change caused by some by-product acting on supporting tissue through which cerebral fluid flows. Sclerotic patches in blood vessels are formed by deposits of dead organisms. Thrombosis is another feature.

The life cycle of zoospores has three stages. The zoospores occur first in red blood corpuscles as statoblasts; 4 strains are recognized. New cultures from submicroscopic forms in filtrates can be grown in serum broth at high temperatures (45 C.). Protoplast is a cell-like structure that produces filaments and globules. Globules sporulate as a fungus and start new colonies. Resemblance to insect viruses is more than casual. Lantern slides will illustrate nerve cell damage.

Age and Susceptibility to Infections in Mice.

I. A. PARFENTJEV, *Department of Microbiology, Yale Universtiy School of Medicine, New Haven, Connecticut.*

Continuing our earlier studies (1953) we have compared the susceptibility of mice of different ages to exposure to influenza virus as well as to certain gram-negative bacteria. For our studies we used female mice of the CFW strain: young weanlings 10-12 Gm., mature mice of about 20 Gm., and old ex-breeders of 30-32 Gm. weight. In experiments with gram negative bacteria we observed that after inoculations with 1.5 billion live cells of *Proteus OX19*, 67 per cent of the mature mice survived as compared with a 17 per cent survival rate among the old ex-breeders. Similar results were observed with *Pasteurella multocida*. However, due to the high virulence of this organism for mice, for inoculation we used only a few hundred organisms. From such an inoculum, 96 per cent of the mature mice survived in contrast to 5.7 per cent of the old ex-breeders. The lethal dose of *Shigella* endotoxin was much larger for young, mature 18 Gm. mice, than for the old ex-breeders (1954). All the old ex-breeding mice died from the dose of *Shigella* endotoxin (0.08-0.4 mg.), and even from a dose as low as 0.003 mg. a large number of them succumbed. Contrary to this, of young mature females, 60 per cent survived an injection of 0.5 mg. of *Shigella* endotoxin and all survived 0.1 mg. and smaller amounts. The reverse effect of aging was observed in the studies of susceptibility of mice to influenza virus. After intranasal administration of the virus in a dilution of 1:10,000, 94 per cent of the mature mice survived, but only 27 per cent of the weanlings. In a series of special experiments we were able to demonstrate that in the state of hypersensitivity, in our work induced by vaccination with *H. Pertussis* vaccine (Parfentjev, Goodland, and Virion, 1947) we were able to increase the susceptibility of mice of all ages to the above described gram-negative bacteria and to virus.

This gerontologic study supports our previous statement (Partfentjev, 1953), that hypersensitivity is of significance in the etiology of infectious diseases.

The results of these and previous experiments suggest that statistical studies of the frequency distribution of infectious diseases at different ages could be supplemented by skin tests with antigens of various disease agents. In man the skin tests would be a counterpart of injection experiments with animals.

This investigation was supported (in part) by research grant from the National Cancer Institute of the National Institutes of Health, Public Health Service.

Pathology and Behavior of Senile Guinea Pigs.

J. B. ROGERS, *Department of Anatomy*, and R. C. TAYLOR, *Department of Pathology, University of Louisville School of Medicine, Louisville, Kentucky.*

The longevity of guinea pigs in a colony of about 400 individuals maintained under different systems of caging will be reported. Observations on reproductivity, diet habits, training, hearing, and vision of senile (surviving more than 1095 days) animals will be reported. The tissue pathology of organs of animals dying in the senile age group will be reported.

Differences Between Young and Old Organisms in *Tokophrya infusionum**

MARIA A. RUDZINSKA, *Rockefeller Institute for Medical Research, New York, New York.*

Unlike most protozoa, *Tokophrya* multiplies by endogenous budding, forming a succession of embryos. The parent organism retains its identity and continues to reproduce for several days to weeks. This way of reproduction permits studies of differences between young and old organisms.

In observations on living organisms it was found that the body of the young *Tokophrya* is pyriform, while the old is irregular in shape. The young organism averages 30 μ and the old 60 μ in diameter. The number of tentacles decreases greatly in the old organism (from 60 to 15 and less). The young organism is able to produce an embryo every 2 to 4 hours, while the old one is unable to reproduce.

More detailed information was obtained from fixed and stained preparations and thin-sectioned material examined under the electron microscope. In such a study it was found that the most significant changes due to aging occur in the macronucleus. The macronucleus, which is surrounded by a double, perforated membrane, is spherical in the young organism and irregular, often loboid, in the old individual. The Feulgen positive, dense chromatin bodies examined by electron microscopy appear as a spongework composed of many fine (90Å) filaments. In the old *Tokophrya* some of the bodies develop an internal cavity, enlarge, elongate, become less dense, and reveal a regular pattern in their structure arranged in parallel arrays. The number of chromatin bodies is about 40 to 50 in the young organism and is over 300 in the old one. The matrix in which the chromatin bodies are suspended is fairly homogeneous in the young organism, while in the older it becomes fibrous. The size of the polyploid macronucleus, which changes greatly during the life span, is about 5 μ in diameter in the young and over 20 μ in the old. In thin sections of old organisms, narrow, deep invaginations formed by the double nuclear membrane may be noticed. In the young organism only one macronucleus is present, while in the old one 2 to 4 macronuclei may be found. It is significant in this connection, that two nucleated cells have been also found in some organs of old mice (Andrew, 1955).

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Age Differences in Glucose Tolerance and the Response to Insulin.

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While there are several reports of decreased glucose tolerance in older people who are not sick, little is known regarding the meaning of this change. Does reduced tolerance mean reduced cell uptake of sugar; is there a deficiency of insulin; is there less response to insulin; are there simply fewer cells in older individuals to metabolize glucose or is there something different about the cells present?

Thirty-five carefully screened male subjects, 23 to 86 years of age, were given an intravenous glucose tolerance test (GTT) and glucose-insulin tolerance test (GITT), using 50 ml. of 50 per cent glucose and 5 units of HGF Insulin/M^2 of body surface. Venous blood was sampled at 5-minute intervals and analyzed by the Nelson-Somogyi method. Analyses of the blood glucose concentrations between 10 and 60 minutes after the injection included linear curves and rate measurements based on semilog plots of glucose concentration and time. The latter were constructed in terms of (a) the "rate" of fall (K) of the total measured glucose concentration, and (b) the true rate of fall (K_c) of the increment in concentration above an asymptote (c) computed for each individual. K (or c) for GTT minus K (or c) for GITT is taken as an index of the response to insulin, $\triangle$ K (or $\triangle$ c) in each subject.

Significant age differences were found in the manner of disappearance of injected glucose, either with or without added insulin. Insulin had a significantly greater effect in younger subjects.

Reproductive Capacities of Different-Age Hamsters (*Cricetus auratus*, Waterhouse).*

A. L. SODERWALL and A. L. BRITENBAKER, *Department of Animal Husbandry, Cornell University, Ithaca, New York.*

One aspect of a program dealing with "Senescence Studies in Reproductive Physiology of the Golden Hamster" considers the factor of reproductive capacities of senescent animals compared with young adults of both sexes.

In the 24 month normal life span of the golden hamster the age of 15 months and older is considered for our purposes as typical of senescence. Histologic evidence favors this time designation. Younger animals used were from 4 to 8 months of age.

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Matings were made between 4 groups listed as:

a.) senescent males x senescent females
b.) senescent males x young females
c.) young males x senescent females
d.) young males x young females

The result of such matings with the number and percentage of successes is shown in the following table:

Animals	*Number*	*Successes*	*% Success*
Senescent males x senescent females	29	10	34.5
Senescent males x young females	26	7	26.9
Young males x senescent females	15	8	53.0
Young males x young females	38	22	58.0
Total matings	108	47	43.5

It appears from the data thus far obtained that the senescent males have the poorest showing throughout. Behavioral estrus cycles displayed by the females of both age groups show no significant difference in over 200 cycles observed as to average length and range in hours of heat (senescent, 19.32, range 13.5-24.0; young 20.09, range 13.5-26.0 hours).

Inheriance of Effects of Parental Age in *Paramecium*

T. M. SONNEBORN, *Department of Zoology, Indiana University, Bloomington, Indiana.*

In *Paramecium aurelia*, as in higher organisms, the life cycle starts with fertilization (conjugation or autogamy), ends with death after 125 days or less, and is marked by progressive changes in vigor or vitality (measured in several ways). New sexual generations may be obtained from parents of any age,—the range 7 to 120 days being covered in the experiments. Series of successive sexual generations, each from parents of the same age (7 days in one series, older and still older in other series), have been observed for cumulative, transmissible effects of parental age. Three classes of sexual offspring arise at autogamy: (1) the vigorous, which have normal life cycles; (2) the subnormal, to various degrees; and (3) the lethals, which die within 4 days. The frequency of vigorous offspring decreases from 99.4 per cent when the parents are 7 days old to zero when the parents are 80 days old or older; conversely, the frequency of lethals rises from 0.4 per cent to 100 per cent; and the frequency of subnormals rises from 0.2 per cent (7 day parents) to a peak of 28 per cent (67 day parents) and declines to zero (80 day and older parents). Vigorous offspring arising from such parents do not transmit effects of parental age, no matter what age it may be; but subnormal offspring do. Moreover, parents so old as to yield only lethal offspring at autogamy can, by conjugation with the young, yield both vigorous and subnormal offspring. Breeding analysis demonstrates that both of these classes of old-by-young hybrids carry abnormal nuclei derived from the old parent. The nuclear damage, resulting from the residence of the nucleus in old cytoplasm, is extensive—as great as from exposure to high doses of X-irradiation—and of similar nature: chromosomal aberrations.

The Effect of Age on the Fumarase Activity of the Human Aorta and Pulmonary Artery.

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In a previous publication from this department (T. J. S. Laursen and J. E. Kirk, J. Gerontol., *10:* 26-30, 1955) the presence of fumarase in human aortic tissue was reported; it was noted that the enzyme activity tended to decrease with the age of the subjects from whom the samples were derived. The present study was undertaken with the purpose of investigating the correlation between age and the fumarase activity of the aorta and pulmonary artery on a large number of samples.

Determination of the fumarase activity was carried out on homogenates of fresh arterial tissue by measurement of the quantities of 1-malic acid formed from fumarate. A macro modification of the fluorometric procedure of Lowry and associates was employed; 106 samples of the descending thoracic aorta and 94 samples of the pulmonary artery were included in the study. The age of the individuals from whom the samples were obtained ranged between 1 month and 92 years.

The measurements revealed a significant decrease in the fumarase activity of both the aorta and pulmonary artery with age. The mean quantities of 1-malic acid formed by the aortic homogenates (mg. 1-malic acid/Gm. wet tissue/hour) were as follows: 0-9 years, 14.6; 10-19 years, 12.1; 20-29 years, 12.1; 30-39 years, 11.0; 40-49 years, 8.9; 50-59 years, 7.8; 60-69 years, 7.4; 70-79 years, 7.1; and 80-92 years, 6.8. For the homogenates of the pulmonary artery the corresponding average values were: 18.6; 17.1; 26.4; 18.2; 14.7; 12.3; 11.9; 12.2; and 8.4. The pulmonary artery in all instances showed a higher fumarase activity than the aorta from the same subject. The coefficient of correlation: age/1-malic acid formation was -0.63 ($t=8.26$, $N=106$) for the aortic samples, and -0.48 ($t=5.26$, $N=94$) for the samples of the pulmonary artery.

The investigation was supported by a grant (PHS-891) from the National Heart Institute of the National Institutes of Health, Public Health Service.

Mucopotein in Nerve Cells of the Dog and Its Alterations During Aging*.

N. M. SULKIN, *Department of Anatomy, Bowman Gray School of Medicine, Winston-Salem, North Carolina.*

The cytoplasm of autonomic and sensory ganglion cells of senile dogs include a PAS positive non-granular deposition (except one dog in which this substance appeared granular) which is mucoprotein in nature and which does not occur in young animals or in neurones of the central nervous system in any age group (Sulkin, 1955).

Following the method of Kramer and Windrum

*Supported by a grant from the Institute of Neurological Diseases and Blindness, Public Health Service.

(1953) sections of nervous tissue were treated with concentrated sulfuric acid and stained with toluidin blue to determine whether sulfation would produce an acid mucopolysaccharide which would stain metachromatically.

Senile ganglion cells treated in this manner contain a cytoplasmic metachromatic deposition which seems homologous to the PAS deposition. The single dog whose ganglion cells contained PAS granules was characterized by metachromatic granules. Moreover, neurones of the central nervous system, including anterior horn cells, Purkinje cells, pyramidal cells, and others contained fine dispersions of metachromatic granules. Examination of neurones of young dogs (3 months to 5 years) indicated that cells in all parts of the nervous system contained these granules. Additional evidence for this phenomenon was obtained with the use of the periodic acid–aldehyde-fuchsin technique and by aldehyde-fuchsin staining following sulfation.

It is concluded that canine neurones contain a mucoprotein, which, except in senile ganglia, is insufficiently concentrated to be demonstrated by the PAS method.

Section on Clinical Medicine

Congenital Hemolytic Anemia Treated at the Age of Sixty.

J. SEIDEL,* M. F. GUZMAN,† and R. K. HORSMAN,‡ *Veterans Administration Hospital, Kerrville, Texas.*

The case history and treatment of a 60 year old World War I veteran is presented. On admission to the hospital the primary cause of symptoms was thought to be chronic pulmonary tuberculosis. Upon further study, however, it was found that he was suffering from congenital hemolytic anemia and that definitive therapy had never been given. Splenectomy was performed three months after admission to our hospital and after careful study of the patient's case. All sputum cultures during the patient's stay in the hospital were negative for acid fast bacilli and there was no x-ray change during his stay in the hospital. It is believed that the clinical improvement shown by the patient was primarily due to definitive therapy undertaken for congenital hemolytic anemia, after many years of known symptoms.

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Section on Psychological and Social Sciences

The Role of Older People in a Florida Retirement Community.

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The purpose of this study was to examine the social aspects of aging in a small retirement community in central Florida. The hypothesis tested was that in a community developed under the aegis of older people, the role of older people may be expected to be different in such dimensions as social participation and social control. The differences may be expected to be in the direction of a role which brings both social approval and personal satisfaction.

Persons 60 years of age and over were considered older. St. Cloud, Florida, an all-white community of 3,000 with 50 per cent over 60 was selected for study because it was developed as a retirement community, its population having 4 times as large a proportion of older people as was found in the population of the United States. During the summer of 1951, a representative sample of 245 older people was interviewed, as well as persons from other age groups and at least one officer from all of the secular and most of the religious organizations. Formal and informal group activities were observed and participated in, and organizational records and other secondary sources read. All data were considered in relation to the older people in the community and the role they lived.

St. Cloud was found to be a migration-developed community in which the clubs and organizations play a primary role in providing social support and recognition for older people. The numerical dominance of older people in St. Cloud's adult population and in the membership and leadership of most organizations contributed to their position of strength and influence. The relatedness of social participation and social control was particularly evident; the older people achieved control of the community through control of its organizations, without carrying direct administrative responsibilities.

Many of St. Cloud's older people used these organized social outlets. Many older people augmented, and others replaced formal with informal participation. For almost half, informal participation represented their only form of social relationships. Some of these relationships were stable and continuing, such as neighborhood cliques. Others tended to be floating contacts, such as were typical of the Post Office, shopping trips, and the downtown green benches.

Largely, St. Cloud had become adapted to its higher proportion of older people. The process of adaptation was facilitated by and expressed through the development of certain services, facilities, and customs. At the same time resentment of the presence and influence of so many older people was found, especially among the young who tended to resolve their conflict by leaving St. Cloud when able.

It was concluded that, in contrast to the usual role of older people in the United States, the position of older people in St. Cloud was socially approved and personally satisfying. Their solidarity was reinforced through the formal organizations which they controlled, and through informal social relationships with persons of like age and interests. Control of these organizations led to control of the community's structure and functioning, and would be a crucial factor in the possible development of an adult education program. Finally, despite areas of conflict, particularly between the young and the old, the community has become accommodated to its older people.

Evidence of Change and Growth in Older People: A Report on the First Two Groups at the Cold Spring Institute.

RUTH ANDRUS,* and R. BENJAMIN,† *The Cold Spring Institute, of the Walt Foundation, Inc., Cold Spring-On-Hudson, New York.*

Two groups of men and women over 55, totalling 22, each experienced for the period of a year a stimulating and supportive program of living as residents of the Cold Spring Institute. Change and growth were studied by means of a variety of psychologic, medical, and physical tests and examinations and a special battery of blood chemistries, at the beginning and end of the term of residence. In addition to these objective tests and examinations, continuous records were kept by the staff, and tape recordings made of all registrant group discussions. The analysis of these data gives evidence of change in such areas as the following:

Depression was lessened.
Self esteem and sense of identity was increased.
Relating to others became easier and more free.
Attention was better directed and sustained; speed of performance increased; intellectual performance improved.
Acceptance, understanding and expression of difference increased with concomitant decrease in prejudice.
Fears were lessened.
Enjoyment in use of body increased.
Reality contact was improved—less projection.
Heightened blood pressure was reduced up to 30 mm. systolic and 16 mm. diastolic.
Vital capacity increased.
Hemoglobin increased up to 2.5 Gm.
Height increased.
Blood chemistry outside the normal range returned to well within normal limits.
Instances of distressing chronic low back pain upon entrance entirely disappeared.
Cases of anemia were alleviated.
Neuromuscular coordination improved markedly.
Greater physical energy was available and used.

The program of living which contributed to this change and growth is described in detail.

*Director.
†Associate Director.

Age Differences in Reaction Time Readiness.

J. BOTWINICK, J. F. BRINLEY, and J. E. BIRREN, *Section on Aging, Laboratory of Psychology, National Institute of Mental Health, National Institutes of Health, D.H.E. & W., Bethesda, Maryland.*

Problem: The purpose of this study was to describe age differences in the relation between speed of response and the time interval between a warning signal and a reaction stimulus. This description of age differences in response readiness is one aspect of the problem of measuring age changes in the intensity and time course of response expectancy as a function of age.

Procedure: Reaction time measurements were made on 54 male subjects; 27 aged 61-83 years, and 27 aged 18-36 years. For each subject 50 finger reaction time measurements were made in a randomized pattern of 8 time intervals between warning and reaction signal. The 8 time intervals were 1, 1⅛, 2, 2⅛, 3, 4, 5, and 6 seconds. The warning signal was a light illuminated for 0.5 sec. and the reaction signal was a 1000 cycle tone of 0.2 sec. duration presented with ear phones. Median reaction time measurements were computed for each subject for each time interval. The data were analyzed by an analysis of variance.

Results: (1) There were age differences in total reaction time.

(2) In addition, there was a significant relation between reaction time and length of the delay interval in both age groups.

(3) The relation, however, was different in the two age groups. That is, the time course of response readiness changed with age. With a 1 sec. delay interval, the mean reaction time for the elderly was .31 sec., whereas for the 6 sec. delay, it was .22 sec. The corresponding values for the young subjects were .21 sec. and .18 sec., respectively.

Differentia of Superior as Contrasted to Problem Old People.

H. BRADSHAW, *(Sponsored by S. L. Pressey) Department of Psychology, Ohio State University, Columbus, Ohio.*

The paper summarizes a phase of a larger study having to do with the intensive case-study investigation of superior old people. The individuals studied had been selected by informal nomination of several people who knew them well, and carefully studied not alone through personal interviews but also in terms of a variety of evidence obtained over a period of time. Sundry individuals were also studied who were roughly of the same general socio-economic and occupational groups, but who were judged to present problems of adjustment or personality. The paper reports an attempt to contrast the last named group with individuals considered especially superior as regards circumstances and characteristics which seemed most differential.

In general, the contrast has emphasized, as important for a satisfactory old age, (a) opportunity to maintain some status in terms of recognized usefulness, as shown either by continued work or other accomplishment of a service type. Also fairly differential in most cases was (b) a situation such that the older person was largely independent in his or her mode of living, and (c) informed and under-

standing orientation regarding problems of age. Sample cases and further details, and certain applications in planning programs for older people, will be given. This paper is largely in further development of a study reported some years ago in the *Journal of Gerontology* by the sponsor, which used written reports rather than the extensive case investigations of the present research.

The Effects of Variables of Subjects and Methods in Gerontologic Research*

E. W. Busse, R. H. Barnes, and L. D. Cohen, *Department of Psychiatry, Duke University School of Medicine, Durham, North Carolina.*

Research design and the selection of subjects in the area of gerontology requires constant attention to the recognition of variables which affect the control group as well as the experimental group. Conclusions, particularly those involving generalizations, must take into account the widely different subcultural influences upon the elderly person. Our studies, which include subjects over the age of 60 from two widely separated geographic locations, emphasize the point that generalizations must be made with caution. The subjects studied in the Rocky Mountain area included 5 groups of elderly persons divided according to socio-economic, cultural, and medical status. Important differences were found in these groups, while some similarities were also noted. Our current studies in the southeastern portion of the United States reveal even more strikingly the extent of the influence of culture and climate upon the elderly subjects.

The influences are wide-spread and appear in the psychologic test material, the psychiatric examination, social adjustment, attitudes towards physicians, motivation in participating as a volunteer, and physical findings.

This paper will provide a review of our research project in reporting the results in specific instances, particularly the differences between groups with attention to the influencing variables.

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The Relation of EEG to Brain Syndrome in Aged Patients.

W. D. Obrist and C. E. Henry, *Institute of Living, Hartford, Connecticut.*

Electroencephalograms were obtained on 120 psychiatric patients, ranging in age from 65 to 95 years. All of the patients were new admissions at two mental hospitals, where complete histories, laboratory studies, and physical and mental examinations were obtained. The diagnostic classification of the American Psychiatric Association was used as a basis for comparing different patients. Those showing evidence of brain syndrome (memory loss, disorientation, intellectual deterioration) were compared with those who showed a minimum of such signs. The former group consisted mostly of patients with advanced generalized arteriosclerosis or neurologic evidence of brain disease. The latter group was composed mostly of patients with affective or paranoid disturbances and only a minimum of intellectual impairment. In such cases, psychogenic factors seemed to be predominant.

A striking difference was observed in the electroencephalograms of the two groups, as revealed by both manual and electronic frequency analysis. Those with brain syndrome showed a high percentage of abnormally slow rhythms and much diffuse theta and delta activity. Those with primarily psychogenic disorders had normal electroencephalograms in a large proportion of cases. Focal EEG disturbances were less satisfactory in differentiating the groups than were generalized abnormalities. It is concluded that electroencephalography may be of value in the differential diagnosis of brain syndrome in aged patients.

Types of Work Older People Can Do Best.

S. L. Pressey, *Department of Psychology, Ohio State University, Columbus, Ohio.*

The usual attitude regarding employment of older people seems to be that in every field some decline in effectiveness is to be anticipated. In contrast, the material summarized in this paper indicates that there are sundry types of work which older people can do better than middle-aged or younger persons.

The above position is based on numerous instances located in several surveys of the activities of old people in several localities. For instance, an elderly physician continued to serve only his long-standing patients, his practice thus becoming largely geriatric and his competence doubly relevant because of his long acquaintance with them and his own age. An elderly lawyer who was a life-long resident of his city specialized in local property problems and in wills. A 97-year-old entomologist wrote a history of his field. A retired dean directed surveys of institutions of higher learning; to this work he brought broad experience and obvious lack of any personal ambition since his own career was over. A retired clergyman served as part-time assistant pastor, specializing in visits to shut-ins. An elderly saleswoman, part-time, nevertheless made the most sales in her specialty shop because of older customers who thought she especially understood their problems. It is believed that old people should be especially useful in both service to oldsters and in research regarding age.

Systematic publicizing of such possibilities and guidance so directed should contribute to morale in age and add usefulness to many fine old people.

What Is It Like To Be Old.

W. H. Reals, *Professor of Adult Education, Washington University, St. Louis, Missouri.*

One is apt to carry in his mind the unpleasant pictures of old age given by those who, like Shakespeare or Byron, had not actually experienced it and therefore did not know much about it.

What will it be like to be old is a question that will be on the minds of most of us sooner or later. And it will not be the same for all: for those with and without sufficient means, for the strong and the infirm, for those who have been in leadership positions, and those who have not.

This paper is an attempt to find out how successful older people regard their later years. It discusses the statements of Cicero, Duff Cooper, Somerset Maugham, and others. Their views and the views of a select group of successful retired business leaders are reported in this study.

Cicero listed 4 liabilities commonly attributed to age, then stated that these need not necessarily hinder one from having a very happy old age. In fact, he and others have pointed out that old age in itself brings many compensations not possible earlier.

A questionnaire was submitted to a group of retired executives, about 50 in number, members of Experience, Incorporated. These men were asked to give their attitudes toward old age. The majority believed that their later years were at least as happy and perhaps even happier than their earlier ones. Only two complained.

Comparative Analysis of Personality Factors in a Geriatric Group Associated with Return to Community Living Versus Continued Residence in a Sheltered Institutional Setting.

CLAIRE M. VERNIER, *Veterans Administration Center, Martinsburg, West Virginia.*

One phase of the general geriatric problem which has attracted increasing attention is the care of the dependent aged. Because of its Domiciliary Program for veterans chronically disabled and unable to earn a living, the Veterans Administration has been directly concerned with many aspects of this problem. In relation to future development of the program, an integrated inter-disciplinary research study was initiated at Martinsburg VA Center.

As part of this research program all new admissions to the Domiciliary during the calendar year 1952 were seen in a screening program which included medical examination, laboratory tests, physical fitness tests, psychologic tests, and interviews by Social Service. Over 200 cases were screened during this period; approximately half were in the age range of 60 or older.

Three groups of 25 cases each were identified: 1) members who were admitted for the first time and continue to remain; 2) members who had one or more previous admissions to the Domiciliary and returned again to the community; 3) members who were admitted for a first time, returned to the community in less than a year, and continued to remain in the community.

All three groups were matched in terms of age, race, intellectual level, socio-economic status, and degree and kinds of physical disability.

Scores from three projective tests, selected on the basis of a preliminary factor analysis, were tabulated for the three groups and the statistical reliability of the differences determined.

The results suggest that certain identified personality factors play a critically important role in the differential living arrangements chosen by older individuals.

How the Wechsler Adult Intelligence Scale was Standardized for Older Persons.

W. L. WALLACE, *The Psychological Corporation, New York, New York.*

In conjunction with the national standardization of the Wechsler Adult Intelligence Scale, a sample of persons over 60 years of age was tested in a special study. A probability sample of older individuals was drawn from the population in Metropolitan Kansas City. Of the 649 persons so identified, field examiners were successful in administering the Wechsler Adult Intelligence Scale to 475.

The methods used by the examiners to gain the cooperation of the subjects varied somewhat but were remarkably successful. The experiences gained in gathering the data should prove to be of value to others seeking to carry out research in gerontology.

The results were studied for the age groups 60-64, 65-69, 70-74, and 75 and over. Evidence was elicited indicating that the norms based on this sample are appropriate for use with persons of similar age throughout the country. With these norms, the mental ability of older persons can be compared with that of their age peers.

Sex differences were also studied, as were the effects of standard time limits versus unlimited time for responses to test questions. Finally, comparisons were made both for over-all performance and for specific abilities among various age groups ranging from 16 to over 75 years.

Section on Social Work and Administration

The Congress of the United States and Our Aged.

A. J. ABRAMS, *Director, New York State Joint Legislative Committee on Problems of the Aging, Newburgh, New York.*

An analysis is presented of major legislation affecting the aging that came before the first session of the 84th Congress: attitudes of party leaders within the U. S. Congress toward old age legislation; pressures upon Congress in the field of the aging; major issues affecting the aged that will come before the next session of Congress; the stake of gerontology in Congressional hearings dealing with appropriations for research are presented. The age composition of the current Congress is set forth.

Recreation for the Aged in Different Cultures.

GEORGENE E. BOWEN, *Director, Education-Recreation for Older People, Health and Welfare Council, Philadelphia, Pennsylvania.*

The Gerontological Tour of Europe in the summer of 1954 gave the opportunity of visiting the native lands of many of America's senior citizens; to observe the cultural patterns and practices there; to compare and evaluate them in the light of American experience in the field of recreation.

The forms of recreation the present older Continental European know are centered around the family and the community. However, the devastation of war, the spread of industrialization, the isolation of the aged in refugee camps and in some housing schemes have torn many of them away from their home communities. On the Continent it has not been discovered how to help aged persons replace lost friendships and restore to them opportunities to participate in community life. Never has their social need been generally recognized.

Industrialization in England and in the United States long ago changed our pattern of living. It scattered and transplanted families. Older people lost not only the holiday gatherings of their families but also the community recreation forms in which they once took part. Under these circumstances, older Britons and Americans have long suffered for the need of companionship and a more satisfying way of life in their later years.

The world in general is not yet aware of the therapeutic value of a leisure-time program, or its importance to the spiritual and physical well-being of elderly human beings. The possibilities of personality development in the atmosphere of enjoyment have but dimly been perceived.

Home, family, and community have been lost to many older people around the world. An objective analysis indicates how traditions and folk ways of the old and new worlds can be combined to help restore these values.

Psychiatric Elements in Aging.

M. E. LINDEN, *Director, Division of Mental Health, Philadelphia Department of Public Health; Regional Director, Commonwealth Mental Health Center, Philadelphia.*

In addition to the normal psychologic needs of the aging it is found that there are essentially 4 groups of psychiatric conditions in later maturity: (1) Chronic brain syndrome, dementia vera of senility, (2) Senile psychosis, (3) Psychosis with cerebral arteriosclerosis, (4) Other psychiatric conditions in the senium.

While the aged have essentially threefold requirements, sociologic, physiologic, and psychologic, these are manifested in psychical activity. Socio-dynamic factors of setting aside isolation and neglect constitute social rejection, either real or imagined, to which the aging individual reacts by an intrapsychic panic state. This may eventuate in tightened defenses or loss of defenses. In both instances intrapsychic regression takes place. Regression can occur to any level of previously experienced psychologic development. Regression may be complete. The stages of arrest are diagnostic of certain neurotic elements which have lain dormant throughout life. The process of regression is reversible in many instances. Therapeutic programs must be aimed at diagnostic entities if treatment is to be effective.

A Good Adjustment.

A. SALAMONE, *Director, Adult Education Center St. Louis University, St. Louis, Missouri.*

Happiness and good health in the later years depend on peace of mind which in turn comes from a sense of being well adjusted.

In terms of planning your life, this poses the need for developing a blueprint of living in line with your desires. A person must begin early in life to discover his proper niche at which he can achieve his best possible personal satisfaction.

The pace of life today creates tensions. Man needs to achieve inner poise and to create new levels of self-discipline, if he is to live creatively in the midst of modern confusion.

We have to decide whether we really believe in the work we are presently doing in regards to our aged, or whether we are only guessing.

Modern science has provided machines which have eliminated many of the personal tasks required in the past that helped build self-discipline and personal interest in living; if we have failed to discipline ourselves to do what we ought to do to achieve and to develop other interests, then we have paid too high a price for our modern conveniences.

In order to fully understand the present day man, especially older man as a living, reacting being, new

concepts and methods must be adapted by psychology and the social sciences.

We need a new basic theory in psychotherapy that will enable us to deal with the real and pressing problems of modern man.

Too many of our present day psychoanalytic groups seem to be devoting more time and energy to defining dogma and buttressing their fortresses rather than to a creative search for new theories, especially concerning longevity, which will lead to new truth.

I believe that today we have the greatest crop of college students in our history. The role of the college student will be that of the leader of the future . . . yet we are not training enough of them to assume leadership in dealing with problems that many of our present day persons will be faced with in their later years. We are not training our present day college graduates on methods for meeting their own old age problems.

A good adjustment—putting a round peg in a round hole—that makes for a satisfactory life . . . and not a major maladjustment, frustration, fear, worry, and chronic unhappiness.

INDEX TO CURRENT PERIODICAL LITERATURE

NATHAN W. SHOCK

Gerontology Section
National Heart Institute
National Institutes of Health

The subject categories are those in *A Classified Bibliography of Gerontology and Geriatrics* by Nathan W. Shock published by Stanford University Press, Stanford, California (1951). Only major headings are used and the Roman numerals correspond to those given in the bibliography. In so far as possible, references are classified according to organ systems. Thus most of the material on Geriatrics will be found under the organ system involved in the disease. Cross references are indicated by number at the end of each section. When available, abstract references are given (*B.A.—Biological Abstracts: P.A.*—Psychological Abstracts: and *P.I.—Population Index*). Abbreviations for journals are those used in *A World List of Scientific Periodicals Published in the years 1900-1933*, 2nd Edition. For journals not listed, abbreviations were devised according to the general rules used in the above source. It is impossible to cover all journals and list all papers concerned with aging and the aged. Authors and publishers are requested to call attention to publications or to send reprints to the Gerontology Section, Baltimore City Hospitals, Baltimore 24, Maryland. The assistance of the Forest Park Foundation, Peoria, Illinois, in the preparation of these materials is gratefully acknowledged.

GERONTOLOGY

14849. Antognetti, L.: Introduzione alla fisiologia della vecchiaia. *Athena, 20:* 339-342, 1954.

14850. Benjamin, B.: The aging population. *Mon. Bull. Min. Hlth. publ. Hlth. Lab. Serv., Lond., 13:* 214-220, 1954.

14851. Benmussa, S.: La gerontologie. *Tunisie Méd., 42:* 1085-1102, 1954.

14852. Binet, L., and F. Bourlière: Symposium sur la biologie du vieillard. *Pr. méd., 62:* 765, 1954.

14853. Brandeberry, J.: Our responsibility to the aging. *Nurs. Outlook, 3:* 44-46, Jan. 1955.

14854. Burstein, S. R.: The historical background of gerontology. *Geriatrics, 10:* 189-193, 1955.

14855. Comfort, A.: The biology of old age. *In:* M. L. Johnson, M. Abercrombie, and G. E. Fogg, (Editors), *New Biology,* Penquin Books, Baltimore, April 1955, No. 18, pp. 9-33.

14856. Cowdry, E. V.: Ageing; a world problem. *Scientia, 89:* 114-121, 1954. *Abstr: P. A., 29:* No. 3767, 1955.

14857. Donahue, W., and C. Tibbitts: European approaches to aging. *Publ. Hlth. Rep., Wash., 70:* 581-584, 1955.

14858. Fleming, C.: Social and individual significance of ageing. *Nature, Lond., 174:* 682, Oct. 1954.

14859. Gaustad, V.: Gerontologic progress in Norway. *Geriatrics, 10:* 248-251, 1955.

14860. Henschen, F.: La verdadera naturaleza del envejecimiento. *Pr. méd., 19:* 231-235, 1954.

14861. Hirsch, S.: Senescence, entropy, and cybernetics; a clarification of basic concepts in gerontological research. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 622-627.

14862. International Association of Gerontology, London, 1954, 3rd Congress: *Old age in the modern world.* E. & S. Livingstone Ltd., London, 1955, vii, 647 pp.

14863. Luzzatto, F.: Ultime considerazioni sulla vecchiaia. *Longevità, 4:* (4), 1-2, 1954.

14864. McConnell, J. L., J. M. Hooks, and E. E. Hoyt, et. al., (Editors): The changing family and its dependents. Part III, in: *American Income and Its use,* Harper, N. Y., 1954, xxii, 362 pp. *Abstr: P. I., 21:* No. 1108, 1955.

14865. Medawar, P. B.: The definition and measurement of senescence. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 4-15.

14866. Myers, R. J.: Accuracy of age reporting in the 1950 United States census. *J. Amer. statist. Ass., 49:* 826-831, 1954. *Abstr: P. I., 21:* No. 2357, 1955.

14867. Parkes, A. S.: Preservation of tissue *in vitro* for the study of ageing. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 162-172.

14868. Quartaroli, A.: *La vecchiaia fisiologica dal punto di vista chimico-fisico.* Giardini Ed., Pisa, 1954, 112 pp.

14869. Rhode Island Committee on Ageing: *Problems of ageing citizens.* Proc. 7th Ann. Inst. Prob. Govt., Univ. R. I., Kingston, Oct. 26, 1954, 36 pp.

14870. Wolstenholme, G. E. W., and M. P. Cameron (Editors): *Ciba Foundation colloquia on ageing. Vol. I. General aspects.* J. & A. Churchill Ltd., London, 1955, xii, 255 pp.

14871. Anonymous: What Dr. Osler really said. *Sci. Amer., 92:* 243, 1905.

See also No. 14885.

BIOLOGY OF AGING

1. Cellular Biology and Physiology (includes plants)

14872. Andrew, W.: Changes in mitochondria in various tissues with ageing of the organism. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 157.

14873. Kirk, J. E., and T. J. S. Laursen: Diffusion coefficients of various solutes for human aortic tissue. With special reference to variation in tissue permeability with age. *J. Geront., 10:* 288-302, 1955.

14874. Laursen, T. J. S., and J. E. Kirk: Diffusion coefficients of carbon dioxide and glucose for a connective tissue membrane from individuals of various ages. *J. Geront., 10:* 303-305, 1955.

14875. Moltke, E.: Wound healing influenced by thyroxine and thyrotrophic hormone; a tensiometric study. *Proc. Soc. exp. Biol., N. Y., 88:* 596-599, 1955.

14876. Nihei, T., T. Sasa, S. Miyachi, K. Suzuki, and H. Tamiya: Change of photosynthetic activity of Chorella cells during the course of their normal life cycle. *Arch. Mikrobiol., 21:* 156-166, 1954.

14877. Pitzurra, M.: Durata del tempo di latenza in relazione all'età della cultura madre. *Nouvi ann. Igiene Microb., 5:* 177-180, 1954.

14878. Wolf, A.: (Demonstration of dying cells in growing culture.) *Chekh. Biol., 3:* 147-151, 1954.

14879. Ziffren, S. E.: The problems of burns in the aged. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 555-559.

See also Nos. 15055, 15091, 15109, 15122, 15360.

IV. Longevity

(case reports, drugs, heredity, marriage, occupation, and sex differences)

14880. Biriukova, R. N.: (The Soviet public health protection and longevity.) *Med. Sestra, Moskva, 11:* 7-11, Nov. 1954.

14881. Dunbar, F.: The long-lived; ageing and illness. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 412-420.

14882. Glass, B.: The genetic background of chronic diseases. (Editorial). *J. chronic Dis., 2:* 96-103, 1955.

14883. Rode, E. A.: Prudential mortality experience by sex. *Trans. actuar. Soc. Amer., 6:* (14), 48-60, 1954. *Abstr: P. I., 21:* No. 2095, 1955.

14884. Shurtleff, D.: Mortality and marital status. *Publ. Hlth. Rep., Wash., 70:* 248-252, 1955.

14885. Simms, H. S., and B. N. Berg: Factors controlling longevity. *Geriatrics, 10:* 229-231, 1955. Also *in:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingston Ltd., London, 1955, pp. 619-622.

See also No. 15460.

IV-C. Longevity: *Comparative Physiology*

14886. Andrejew, A.: Metabolisme intermédiaire des Mycobactéries; disparition des cytochromes des bacilles tuberculeux en fonction de l'âge de la culture; étude spectroscopique. *C. R. Soc. Biol., Paris, 148:* 995-996, 1954.

14887. Binet, L.: Fattori di senescenza in patologia comparata. (Abstract). *Riv. Geront. Geriat., 5:* 28, 1955.

14888. Chabaud, A. G.: Sur le cycle évolutif des spirurides et de nématodes ayant une biologie comparable; valeur systématique des caractères biologiques. *Ann. parasit., 29:* 358-425, 1954.

14889. Clarks, J. M., and M. J. Smith: Hybrid vigour and longevity in *Drosophila subobscura. In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 628-630.

14890. Comfort, A.: Absence of a parental age effect upon the longevity of the fruit fly *Drosophila subobscura. In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 628.

14891. Donaldson, H. H.: *The rat; data and reference tables for the albino rat and the Norway rat.* Memoirs of Wistar Inst. Anat. Biol., Phil., 2nd Ed., 1924, xiv, 469 pp.

14892. Garnham, P. C.: The life history of the malaria parasite. *Lect. Sci. Basis Med., 2:* 323-333, 1952-53.

14893. Helmke, R.: Über die Beeinflussung der inaktivierenden Wirkung der Wellenlänge 2537 Å auf streptomyces griseus-Sporen durch Kälte und physiologisches Altern. *Zbl. Bakt., 162:* 100-103, 1955.

14894. King, H. D.: Life processes in gray Norway rats during fourteen years in captivity. *Amer. anat. Mem.,* No. 17, 5-77, 1939.

14895. King, H. D., and H. H. Donaldson: Life processes and size of the body and organs of the gray Norway rat during ten generations in captivity. *Amer. anat. Mem.,* No. 14, 5-106, 1929.

14896. Schoenherr, K. E.: Untersuchungen über die Lebensdauer von Typhusbakterien in Sauerkraut. *Arch Hyg., Berl., 138:* 511-514, 1954.

14897. Silberberg, R., M. Silberberg, and S. Riley: Life span of "yellow" mice fed enriched diets. *Amer. J. Physiol., 181:* 128-130, 1955.

14898. Simitch, T., Z. Petrovitch, and D. Chibalitch: La longévité des kystes d'Entamoeba dysenteriae dans les denrées alimentaires. *Arch. Inst. Pasteur l'Algerié, 32:* 305-308, 1954.

14899. Vogel, H., and J. Falcão: Über den Lebenszyklus der Lanzettegels, *Dicrocoelium dendriticum,* in Deutschland. *Z. Tropmed. Parasit., 5:* 275-296, 1954.

See also No. 15108.

IV-H. LONGEVITY: *Mortality Rates*

14900. Freudenberg, K.: (A new calculation of corrected cancer mortality.) *Ärztl. Wschr., 9:* 1240-1242, 1954.

14901. Hamilton, H. C.: *Health progress in North Carolina from 1940-1950 as measured by age-adjusted mortality tables.* N. C. St. Coll., Raleigh, 1954, Prog. Rep. RS-21, 8 pp. *Abstr: P. I., 21:* No. 2099, 1955.

14902. Hammond, E. C.: Smoking and death rates. *S. Dak. J. Med., 8:* 16-23, 1955.

14903. Iversen, S.: Human cancer and age. *Brit. J. Cancer, 8:* 575-584, 1954.

14904. Kretz, J.: Die Krebssterblichkeit der Wiener Wohnbevölkerung im Jahre 1952. *Krebsarzt, 8:* 217, 1953.

14905. Mancuso, T. F., E. M. MacFarlane, and J. D. Porterfield: The distribution of cancer mortality in Ohio. *Amer. J. publ. Hlth., 45:* 58-70, 1955.

14906. Metrop. Life Insur. Co.: Trends in respiratory cancer mortality. *Statist. Bull. Metrop. Life Insur. Co., 35:* 3-6, Oct. 1954. *Abstr: P. I., 21:* No. 2121, 1955.

14907. Rice, M. E., and C. Powell: *Life tables for Mississippi, 1930, 1940, 1950, abridged.* Miss. St. Coll., 1954, Soc. Sci. Stud., Demogr. Series 1, 34 pp. *Abstr: P. I., 21:* No. 2103, 1955.

14908. Schlomka, G.: Über Möglichkeiten einer statistischen Alterncharakteristik auf Grund von Morbiditätszahlen. *Z. Altersforsch., 8:* 318-336, 1955.

14909. Tromp, S. W.: Statistical study of the possible relationship between mineral constituents in drinking-water and cancer mortality in the Netherlands (period 1900-1904). *Brit. J. Cancer, 8:* 585-594, 1954.

14910. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Death and death rates for 64 selected causes; United States, each division and state, Alaska, Hawaii, Puerto Rico, and Virgin Islands, 1952. *Vit. Statist., Spec. Rep., 40:* (5), 105-128, 1954. *Abstr: P. I., 21:* No. 2400, 1955.

14911. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: United States life tables; 1949-1951. *Vit. Statist., Spec. Rep., 41:* (1), 1-32, 1954. *Abstr: P. I., 21:* No. 2105, 1955.

14912. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Mortality from each cause United States; 1951-1953. *Vit. Statist., Spec. Rep., National Summaries, 42:* (4), 57-85, 1955.

14913. Anonymous: Tuberculosis mortality in Finland. *Bull. World Hlth. Org., 12:* 211-246, 1955.

IV-I. LONGEVITY: *National Groups*

14914. Austria. Statistisches Zentralamt: Die Sterbefälle und Todesursachen im Jahre 1953. *Statist. Nachr., 9:* 394-398, 1954. *Abstr: P. I., 21:* No. 2110, 1955.

14915. Brazil. Conselho Nacional de Estatística: *A mortalidade da população paulista.* Estudos Demográficos No. 92, Rio de Janeiro, 2nd Ed., 1954, 16 pp. *Abstr: P. I., 21:* No. 2075, 1955.

14916. Brazil. Conselho Nacional de Estatística: *Tábuas de sobrevivência para o Município de São Paulo, segundo a mortalidade do período 1949-1951.* Estudos Demográficos No. 100, Rio de Janeiro, 1954, 10 pp. *Abstr: P. I., 21:* No. 2096, 1955.

14917. Canada. Dominion Bureau of Statistics: *Vital statistics; 1953.* Queen's Printer, Ottawa, 1955, 134 pp. *Abstr: P. I., 21:* No. 2387, 1955.

14918. Costabile-Barnabei, M.: Dati indicativi statistici sull'andamento della mortalità tra la popolazione italiana. *Gior. Geront., 3:* 104-119, 1955.

14919. Costa Maia, J.: *Exemplos de tabelas de sobrevivência da população portuguesa.* Centro Estud. Demograf., No. 8, 1954, pp. 95-105. *Abstr: P. I., 29:* No. 2097, 1955.

14920. El Salvador. Dirección General de Estadística y Censos: Tabla de vida abreviada para la República de El Salvador. Años 1949-1951. *Bol. Estad.*, No. 13, 26-30, Jan.-Feb. 1954. *Abstr: P. I., 29:* No. 2098, 1955.

14921. England. Birmingham. Central Statistical Office: *Abstract of statistics; No. 3, 1953-1954.* The Office, Birmingham, 1954, xiv, 140 pp. *Abstr: P. I., 21:* No. 2429, 1955.

14922. Germany. Federal Republic. Statistisches Bundesamt: Die Sterbefälle im Jahre 1953 nach Todesursachen, Alter und Geschlecht. *Wirtsch. u. Stat., 6:* 570-573, 1954. *Abstr: P. I., 21:* No. 2114, 1955.

14923. Gramm, H.: Sterblichkeit, Todesursachen und Lebensalter. *Z. Altersforsch., 8:* 348-365, 1955.

14924. Great Britain. General Register Office. England and Wales: *The Registrar General's statistical review of England and Wales for the year 1953. Part I. Medical tables.* H. M. Stationery Office, London, 1954, x, 366 pp. *Abstr: P. I., 21:* No. 2427, 1955.

14925. Great Britain. Ministry of Health: *Report of the Ministry of Health for the year ended 31st December 1953. Part II. On the state of the public health . . . Command 9307.* H. M. Stationery Office, London, 1954, vi, 262 pp. *Abstr: P. I., 21:* No. 2428, 1955.

14926. Metrop. Life Insur. Co.: Mortality trends here and abroad. *Statist. Bull. Metrop. Life Insur. Co., 35:* 3-5, Sept. 1954. *Abstr: P. I., 21:* No. 2076, 1955.

14927. Norway. Statistisk Sentralbyrå: (Life tables according to the mortality experience of 1946-1950.) *Norges Offisielle Statist.*, XI, 182, 1-66, 1954. *Abstr: P. I., 21:* No. 2101, 1955.

14928. Pressat, R.: Vues générales sur la mortalité française depuis la guerre. *Population, 9:* 477-506, 1954. *Abstr: P. I., 21:* No. 2078, 1955.

14929. Ros Jimeno, J.: Mortalidad y esperanza de vide. *Rev. int, Sociol., 11:* (43), 79-103, 1953. *Abstr: P. I., 21:* No. 2104, 1955.

14930. Schmidt-Lange, W.: Volkshygiene und die Lebensfrage Europas. *Münch. med. Wschr., 96:* 337-338, 1954.

14931. Statistical Office of the United Nations: *Demographic yearbook — 1954.* United Nations Publication, N. Y., 6th Ed., 1954, xiii, 729 pp.

See also Nos. 15164, 15453.

V. Metabolism

14932. Barillari, F.: Sull'azione proteo-anabolica del testosterone in prostatopazienti. *Riv. Geront. Geriat., 5:* 18-27, 1955.

14933. Daum, K., W. W. Tuttle, A. Weber, M. T. Schumacher and J. Salzano: Calcium and phosphorus utilization in older men. *J. Amer. dent. Ass., 31:* 149-151, 1955.

14934. Garcia, P., C. Roderuck, and P. Swanson: The relation of age to fat absorption in adult women together with observations on concentration of serum cholesterol. *J. Nutrit., 55:* 601-609, 1955.

14935. Johnston, L. C., and L. M. Bernstein: Body composition and oxygen consumption of overweight, normal, and underweight women. *J. Lab. clin. Med., 45:* 109-118, 1955.

14936. Lorenzi, G. L., and B. De Bernard: Studi sulla biochimica dell'ossificazione. IV. Contenuto di cocarbossilasi nella cartilagine metafisaria e nel sangue del coniglio in relazione all'età. *Boll. Soc. ital. Biol. sper., 30:* 451-453, 1954.

14937. Malm, O. J., R. Nicolaysen, and L. Skjelkvale: Calcium metabolism in old age as related to ageing of the skeleton. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 109-125.

14938. Patton, M. B.: Further experiments on the utilization of calcium from salts by college women. *J. Nutrit., 55:* 519-526, 1955.

14939. Richet, C.: La ration protidique chez l'adulte. *Sem. Hôp. Paris, 31:* 132-134, 1955.

14940. Roberts, P. H., C. H. Kerr, and M. A. Ohlson: Nutritional status of older women — nitrogen, calcium, phosphorus retentions of nine women. *J. Amer. diet. Ass., 24:* 292-299, 1948.

14941. Schulze, W.: Protein metabolism and requirement in old age. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 122-127.

14942. Shock, N. W., D. M. Watkin, and M. J. Yiengst: Metabolic aspects of ageing: *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 127-137.

See also Nos. 14951, 14977, 15082.

VI. Nutrition

14943. Bonessa, C., and E. Pannaggi: Il glutammato di sodio nella dieta del vecchio. (Abstract). *Gior. Geront., 3:* 180, 1955.

14944. Finzi, M.: Vitamine E senescenza. *Acta geront., 4:* 188-191, 1954.

14945. Kaplan, L., J. H. Landes, and J. Pincus: The nutritional status of noninstitutionalized aged persons. *Geriatrics, 10:* 287-290, 1955.

14946. McCance, R. A., and E. M. Widdowson: A fantasy of ageing and the bearing of nutrition upon it. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 186-194.

14947. McCay, C. M.: Bridging the gap between research and gerontological nutrition. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 99-106.

14948. McCay, C. M.: Research areas in gerontology nutrition that are now neglected. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 173-185.

14949. Reid, M. E.: Urinary excretion of ascorbic acid by guinea pigs at different ages. *J. Nutrit., 35:* 619-627, 1948.

14950. Silberberg, M., and R. Silberberg: Diet and life span. *Physiol. Rev., 35:* 347-362, 1955.

14951. Silberberg, R., and M. Silberberg: Life span of mice fed a high fat diet at various ages. *Canad. J. Biochem. Physiol., 33:* 167-173, 1955.

14952. Sinclair, H. M.: Too rapid maturation in children as a cause of ageing. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing.* Vol. *I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 194-208.

14953. Sinclair, H. M.: The dangers of overfeeding. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 106-113.

14954. Sperling, G., F. Lovelace, L. L. Barnes, C. A. H. Smith, J. A. Saxton, Jr., and C. M. McCay: Effect of long time feeding of whole milk diets to white rats. *J. Nutrit., 55:* 399-414, 1955.

14955. Widdowson, E. M., and R. A. McCance: The response of well-nourished old men to starvation and of under-nourished old men to unlimited food. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 113-122.

14956. Young, C. M., C. F. Streis, and B. J. Greer: Food usage and habits of older workers. *Arch. industr. Hyg. & occup. Med., 10:* 501-511, 1954.

See also Nos. 14897, 14934, 14978, 14985, 15402.

X. THEORIES

14957. Bürger, M.: Altern und Krankheit. *Zahnärztl. Rdsch., 64:* 2-5, 1955.

14958. Korenchevsky, V.: Autointoxications and processes of ageing. *Texas Rep. Biol. Med., 12:* 1006-1036, 1954.

ORGAN SYSTEMS

I. BLOOD

14959. Angeli, G., G. Tedeschi, and F. Cavazzuti: Il tasso dei basofili del sangue periferico nel soggetto normale, valutato con un nuovo metodo di conta diretta. *Progr. med., Napoli, 10:* 742-745, 1954.

14960. Creyx, M., J. Levy, H. Destrem, and A. L. Buznic: Sur trois cas d'anémie de Biermer chez des vieillards. *J. Méd. Bordeaux, 131:* 1253-1256, 1954.

14961. Eadie, G. S., and I. W. Brown, Jr.: The potential life span and ultimate survival of fresh red blood cells in normal healthy recipients as studied by simultaneous Cp^{51} tagging and differential hemolysis. *J. clin. Invest., 34:* 629-636, 1955.

14962. Hollingsworth, J. W.: Lifespan of fetal erythrocytes. *J. Lab. clin. Med., 45:* 469-473, 1955.

14963. Hollingsworth, J. W., and D. R. Hollingsworth: *Study of total red cell volume and erythrocyte survival using radioactive chromium in patients with far advanced pulmonary tuberculosis.* Army Med. Serv. Graduate Sch., Walter Reed Army Medical Center, Proj. #6-59-12-027, Aug. 1954, Subtask No. 18, pp. 1-7.

14964. Hudson, A. E. A.: Fragility of erythrocytes in blood from swine of two age groups. *Amer. J. vet. Res., 16:* 120-122, 1955.

14965. Kiczak, J., and Z. Wroblewska: (Normal leukocyte count in the peripheral blood in adults.) *Polsk. Tygod. lek., 10:* 110-113, 1955.

14966. Mollison, P. L.: The life-span of red blood-cells. *Lect. sci. Basis Med., 2:* 269-286, 1952-53.

14967. Reynafarje, C., N. I. Berlin, and J. H. Lawrence: Red cell life span in acclimatization to altitude. *Proc. Soc. exp. Biol., N. Y., 87:* 101-102, 1954.

14968. Stecher, G.: Art und Verlaufsform der Leukämien in verschiedenen Lebensaltern. *Z. Altersforsch., 8:* 336-343, 1955.

14969. Van Dyke, D. C., C. W. Asling, N. I. Berlin, and R. G. Harrison: Failure of cobalt to influence the life span of the erythrocyte. *Proc. Soc. exp. Biol., N. Y., 88:* 488-489, 1955.

I-A. BLOOD: *Chemistry*

14970. Ackermann, P. G., H. J. Buehler, G. Toro, and W. B. Kountz: Serum cholesterol, phospholipid and lipoprotein levels in elderly male subjects. *Proc. Soc. exp. Biol., N. Y., 88:* 447-448, 1955.

14971. Altschul, R.: Lowering of serum cholesterol by ultraviolet irradiation. *Geriatrics, 10:* 208-212, 1955.

14972. Antonini, F. M.: Serum glycolipoproteins, polysaccharides, and heparinoid substances in old age and atherosclerosis. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 522-523.

14973. Antonini, F. M.: The β/α ratio of plasma lipoproteins from youth to old age in human and experimental atherosclerosis. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 523.

14974. Antonini, F. M., L. Salvini, and A. Sordi: The effect of heparin on serum lipids and lipoproteins in human and experimental atherosclerosis. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 523-524.

14975. Dunlap, J. S.: The effect of age and pregnancy on bovine blood protein fractions. *Amer. J. vet. Res., 16:* 91-95, 1955.

14976. Eiber, H. B., A. A. Goldbloom, O. Deutschberger, I. Chapman, and W. R. Loewe: An outline of the newer methods of study of atherosclerosis; with emphasis on the 80-100 year group. *Geriatrics, 10:* 213-220, 1955.

14977. Gillum, H. L., A. F. Morgan, and D. W. Jerome: Nutritional status of the ageing. IV. Serum cholesterol and diet. *J. Nutrit., 55:* 449-468, 1955.

14978. Gillum, H. L., A. F. Morgan, and F. Sailer: Nutritional status of the ageing. V. Vitamin A and carotene. *J. Nutrit., 55:* 655-670, 1955.

14979. Goldbloom, A. A.: Newer clinical and laboratory studies in the aged. V. Lipidogram by paper electrophoresis in normal patients 80-100 years of age; a preliminary report. *Amer. J. digest. Dis., 22:* 51-58, 1955.

14980. Goldbloom, A. A., and H. B. Eiber: Newer clinical and laboratory studies in the aged. VI. Serum lipids, lipoproteins and atherogenic index in "normal" subjects 80-100 years of age. *J. Amer. geriat. Soc., 3:* 367-380, 1955.

14981. Herbeuval, R., G. Cuny, M. Manciaux, and J. Hansen: The study of the distribution of blood protein fractions in 200 aged subjects. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 574-578.

14982. Hill, R. M., and V. Trevorrow: Plasma albumin, globulin and fibrinogen in healthy individuals from birth to adult life. *J. Lab. clin. Med., 26:* 1838-1849, 1941.

14983. Hobson, W.: Some studies of blood biochemistry in the elderly. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 384-392.

14984. Jakobsen, P. E., and J. Moustgaard: Untersuchungen über die Serumproteine bei Schweinen von der Geburt bis zur Geschlechtsreife. *Nord. vet. Med., 2:* 812, 1950.

14985. Morgan, A. F., H. L. Gillum, and R. I. Williams: Nutritional status of the aging. III. Serum ascorbic acid and intake. *J. Nutrit., 55:* 431-448, 1955.

14986. Morgan, A. F., M. Murai, and H. L. Gillum: Nutritional status of the aging. VI. Serum protein, blood nonprotein nitrogen, uric acid and creatinine. *J. Nutrit., 55:* 671-685, 1955.

14987. Nitsch, W.: Über den Eiweissegehalt des menschlichen Blutserums (zur Kritik einer Methode). *Z. ges. innere Med., 3:* 540-542, 1948.

14988. Orlowski, T., and B. Kleczkowski: (Blood protein level in normal males.) *Polsk. arch. Med. Wewn., 24:* 63-70, 1954.

14989. Parfentjev, I. A., and M. L. Johnson: The plasma protein pattern and its significance in geriatrics and cancer diagnosis. *Geriatrics, 10:* 232-238, 1955.

14990. Polson, A.: Variation of serum composition with the age of horses as shown by electrophoresis. *Nature, Lond., 152:* 413-414, 1943.

14991. Rechenberger, J., and G. Hevelke: Die Tagesrhythmik des Serumeisenspiegels in ihrer Abhängigkeit vom Lebensalter. *Z. Altersforsch., 8:* 343-347, 1955.

14992. Smith, M. J., and K. W. Taylor: Blood concentrations of pyruvic and α-ketoglutaric acids in normal people and diabetic patients. *Lancet, 1:* 27, 1955.

14993. Trevorrow, V., M. Kaser, J. P. Patterson, and R. M. Hill: Plasma albumin, globulin, and fibrinogen in healthy individuals from birth to adulthood. II. "Normal" values. *J. Lab. clin. Med., 27:* 471-486, 1942.

14994. Viergiver, E.: The concentration of urea nitrogen, creatinine, and uric acid in the serum of normal individuals. *Bull. Ayer clin. Lab., 4:* (21), 61-66, 1954.

14995. Wilkinson, C. F., Jr.: Effects of lipotropes and sitosterol on the level of blood lipids and the clinical course of angina pectoris.

J. Amer. geriat. Soc., 3: 381-388, 1955.

See also Nos. 14932, 14934, 14986, 15077.

III. Cardiovascular System

(blood vessels, blood pressure, hypertension, blood volume, veins, and arteriosclerosis)

14996. Antonini, F. M., L. Salvini, and A. Sordi: Relationship between lipoproteins, heparinoid substances in plasma, and the pathogenesis of atherosclerosis. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 521-522.

14997. Bonessa, C., and U. Milla: Ricerche sulla permeabilità capillare nel vecchio con il metodo di Amsler e Huber. (Abstract). *Gior. Geront., 3:* 180, 1955.

14998. Canepa, R.: Trattamento dell'ipertensione dell'età senile con jodio associato a vitamina C. *Riv. Geront. Geriat., 4:* 245-255, 1954.

14999. Dacso, M. M.: Changes in the circulation of the hemiplegic extremities; an experimental and clinical study. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 492-499.

15000. Droller, H., J. Pemberton, C. Roseman, and J. Grout: Cardiovascular disease in a random sample of elderly people. *Brit. med. J., 2:* 968, 1952.

15001. Epstein, F. H., and E. P. Boas: The prevalence of manifest atherosclerosis among randomly chosen Italian and Jewish garment workers; a preliminary report. *J. Geront., 10:* 331-337, 1955.

15002. Franklin, K. J.: The last half-millimetre, or the blood capillaries. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 476-492.

15003. Greppi, E.: The temporal arthritis (Horton's disease) in the aged. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 519-521.

15004. Grollman, A.: The interrelationship of hypertension, arteriosclerosis, and the ageing process. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 517-519.

15005. Hartroft, W. S.: The premature ageing of the cardiovascular system produced in young rats by dietary choline deficiency. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 475-476.

15006. Lansing, A. I.: Ageing of elastic tissue and the systemic effects of elastase. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 88-108.

15007. McMillan, G. C., L. Horlick, and G. L. Duff: Cholesterol content of aorta in relation to severity of atherosclerosis; studies during progression and retrogression of experimental lesions. *Arch. Path., Chicago, 59:* 285-290, 1955.

15008. Norgaard, A.: (Blood pressure in older persons of full physical fitness.) *Nord. Med., Stockholm, 53:* 311-313, 1955.

15009. Rinzler, S. H., J. Travell, and D. Karp: Detection of coronary atherosclerosis in the living animal by the Ergonovine stress test. *Science, 121:* 900-902, 1955.

15010. Scanu, A.: Possibilità e limiti dell'impiego dell'eparina in piccole dosi nel trattamento della malattia ateriosclerotica umana. *Gior. Geront., 3:* 155-168, 1955.

15011. Scanu, A., and S. Schiano: Tentativo di applicazione della reazione di nagler alla diagnostica sierologica della malattia aterosclerotica umana. *Acta geront., 4:* 179-187, 1954.

15012. Vega Díaz, F.: *Algunos problemas clínicos de la cardiopatología senil.* II Cong. Nacional Geront. y Geriat., Valencia, July 1954, 375 pp.

15013. Vergani, L.: Aspetti semeiologici dell'apparato cardiovascolare senile. *Longevità, 4:* (4), 19-22, 1954.

15014. Anonymous: A medicação preventiva da hipertensão dos velhos. *Med. cirurg. Pharm., Rio de J., 223:* 533-534, 1954.

See also Nos. 14873, 14995, 15036, 15170, 15292.

III-G. Cardiovascular System: *Heart*

(heart, anatomy and physiology, heart disease, coronary artery disease, and myocardial disease)

15015. Barbareschi, G.: Arteriosclerosi coronarica; studio istopatologico con particolare riferimento all'apparato elastico. *Gior. Geront., 3:* 195-225, 1955.

15016. Borges, V. V., and P. Schlesinger: A cardiopatia reumática após os 40 anos de idade. *Arq. brasil Med. nav., 44:* 373-382, 1954.

15017. Burton, C. R.: Anticoagulant therapy in fresh infarction of the heart. *J. Amer. geriat. Soc., 3:* 226-231, 1955.

15018. Cesarman Vitis, T., E. Sahagún De La Parra, and C. J. Sánchez Pena: El corazón en la edad avanzada. *Arch. Inst. Cardiol. México, 24:* (2), 158-174, March 1954.

15019. Clawson, B. J.: Syphilitic cardiac deaths in over fifty thousand autopsies. *Minn. Med., 33:* 437-440, 1950.

15020. Frhr, H., and B. Kress: Das Altersherz. *Dtsch. med. J., 3:* 373, 1952.

15021. Gillmann, H., and W. Vogel: Über das Elektrokardiogramm im Greisenalter. *Dtsch. med. Wschr., 80:* 283-285, 1955.

15022. Gregorczyk, K.: (Electrocardiography in aged.) *Polsk. Tygod. lek., 9:* 1186-1189, 1954.

15023. Kazmeier, F., W. Schild, and W. Schild: Zur Frage des Einflusses der durch die Keimdrüsenhormone und durch Alterungsvorgänge bedingten Gefässveränderungen auf das Ballistokardiogramm. *Zbl. Gynäk., 76:* 2027-2032, 1954.

15024. Kitchell, J. R.: Management of the patient with coronary atherosclerosis. *J. Okla. med. Ass., 48:* 31-37, 1955.

15025. Köhler, H., and G. Dirksen: Über Zellveränderungen in den Herzganglien des Haus-und Wildschweines und deren Bedeutung. *Dtsch. tierärztl. Wschr., 61:* 174, 1954.

15026. Olbrich, O., E. Woodford-Williams, and D. Webster: The measurement of cardiac output in the aged with sodium fluorescein. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 499-517.

15027. Rodstein, M.: The diagnosis of cardiac hypertrophy in the aged; clinical pathological correlations in 55 individuals. *Amer. J. med. Sci., 229:* 525-533, 1955.

15028. Schlegel, R.: Über die Verteilung verschiedener Herzformen auf Alter und Geschlecht. *Münch. med. Wschr., 96:* 1159-1161, 1954.

15029. Schnur, S.: Mortality rates in acute myocardial infarction. III. The relation of patient's age to prognosis. *Ann. intern. Med., 41:* 294, 1954.

15030. Starr, I.: Normal standards for amplitude of ballistocardiograms calibrated by force. *Circulation, 11:* 914-926, 1955.

15031. Stroud, W. D.: Patients with healed myocardial infarction should work. *Geriatrics, 10:* 184-188, 1955.

15032. Vega Díaz, F.: Problemas cardiovasculares de los estados de choque en el anciano. *Folia clin. int., 4:* (11), 1-18, 1954.

15033. Zimmermann-Meinzingen, O., E. Wustinger, and K. Hofbauer: Die Altersgruppierung und dispositionelle Faktoren des akuten Myokardinfarktes. *Wien. med. Wschr., 104:* 1007-1010, 1954.

See also Nos. 15133, 15180.

IV. Connective Tissue and Cartilage

15034. Delaunay, A.: Le vieillisement du tissu conjonctif et des substances intercellulaires. *Concours méd., 77:* 435-436, 1955.

15035. Hall, D. A.: The mineral requirements of the elastase-elastin system. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 165-171.

15036. Wood, G. C.: Some properties of the collagen component of elastic tissue and their change with age. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 157-164.

See also Nos. 14874, 14936, 15099, 15108, 15116, 15130, 15357.

V. Endocrine System

(includes sex glands and climacteric)

15037. Assus, A., and J. Morali: A propos d'une hémorragie utérine après la ménopause. *Bull. Féd. soc. gyn. obst. fr., 6:* 475-476, 1954.

15038. Bernhard, P.: Die klimakterische Fettsucht und ihre Behandlung. *Med. Mschr., 8:* 793-797, 1954.

15039. Blumenthal, H. T.: Influence of weight (age) diet and dosage on response of thyroid and parathyroid glands of male guinea pig to potassium iodide; effect of this substance on adrenal gland. *Endocrinology, 31:* 226-236, 1942.

15040. Blumenthal, H. T.: Aging processes in the endocrine glands of various strains of normal mice; relationship of hypophyseal activity to aging changes in other endocrine glands. *J. Geront., 10:* 253-267, 1955.

15041. Bomski, H.: (Age, sex and occupation of patients with Addison-Biermer's anemia.) *Polsk. Tygod. lek., 10:* 981-991, 1954.

15042. Boot, L. M., and O. Mühlbock: The ovarian function in old mice. *Acta physiol. pharm. neerl., 3:* 463-464, 1954.

15043. Eckstein, P.: The duration of reproductive life in the female. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 190-199.

15044. Freeman, H., G. Pincus, F. Elmadjian, and L. P. Romanoff: Adrenocortical reactivity in aged schizophrenic patients. *In:* G. E.

W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 219-247.

15045. Gayet-Hallion, T., and I. Bertrand: Variation, suivant l'âge, de l'induction mitogénétique dans le corps thyroïde du rat. *Arch. Sci. phys. nat., 8:* 279-285, 1954.

15046. Greenblatt, R. B.: Metabolic and psychosomatic disorders in menopausal women. *Geriatrics, 10:* 165-169, 1955.

15047. Hamburger, C.: Six years' daily 17-ketosteroid determinations in one subject; seasonal variations and independence of volume of urine. *Acta endocrinol., 17:* 116-127, 1954.

15048. Hartl, F., and C. Fischer: Morphologische Veränderungen an der Adenohypophyse des Menschen und ihre Beziehungen zu Lebensalter, Geschlecht und Konstitution. *Z. Altersforsch., 8:* 301-308, 1955.

15049. Hess, E., R. B. Roth, and A. F. Kaminsky: Is there a male climacteric? *Geriatrics, 10:* 170-173, 1955.

15050. Heupke, W., and G. Meyerheim: Zuckerkrankheit und Lebenserwartung. *Münch. med. Wschr., 96:* 1303-1305, 1954.

15051. Kambe, S., S. Yamamoto, T. Nakanishi, and K. Ito: Pineal body tumor in a sixty year old man. *Gann, Tokyo, 45:* 326-327, 1954.

15052. Kinsell, L. W.: Emergency and prophylactic corticoid therapy in individuals past 50. *J. Amer. geriat. Soc., 3:* 285-291, 1955.

15053. Klöppner, K.: Thekazellgeschwulst Dauerblutungen in der Menopause und Fibromyom des Uterus bei 69 jähriger Patientin mit Zeichen von Verjüngung. *Medizinische, Stuttgart, 47:* 1576-1577, 1954.

15054. Krag, C. L.: The community health aspects of diabetes mellitus among older people. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 547-552.

15055. Krohn, P. L.: Tissue transplantation techniques applied to the problem of the ageing of the organs of reproduction. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 141-161.

15056. Küchel, O., and V. Hruska: (Contribution to the clinic of thyrotoxicosis in the aged.) *Čas. Lék. čes., 93:* 1337-1339, 1954.

15057. Kühne, P., and H. Billion: Die Altersregression der Schilddrüsenfunktion im Radiojodtest. *Ärztl. Wschr., 10:* (3), 62, 1955.

15058. Lichtwitz, A., and J. Crepeaux: L'impianto ormonale polisteroide; cura della menopausa senescente. (Abstract). *Riv. Geront. Geriat., 5:* 30-31, 1955.

15059. Lugg, J. W., and J. M. Bowness: Renal excretion of 17-ketosteroids by members of some ethnic groups living in Malaya. *Nature, Lond., 174:* 1147-1148, 1954.

15060. McGavack, T. H., J. Chevalley, and S. Pearson: Variations in the response of individuals of different ages to an antithyroid compound (methimazole). *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 202-211.

15061. Mapp, L. M.: Ovarian tumors in Honolulu, Hawaii; their racial frequency and age distribution. *Hawaii med. J., 14:* 218-220, 1955.

15062. Mårtensson, J.: Cardiovascular and renal findings in longstanding diabetes mellitus. A study of 221 patients surviving at least 15 years. *Acta med. scand., 138:* 94-107, 1950.

15063. Masters, W. H.: Rationale of sex steroid replacement in the "neutral gender." *J. Amer. geriat. Soc., 3:* 389-395, 1955.

15064. Molitor, K.: Die Frau im Klimakterium. *Dtsch. Gesundhwes., 9:* 1411-1417, 1954.

15065. Neber, H.: Bestehen Beziehungen zwischen einem Leberschaden und klimakterischen Beschwerden? *Zbl. Gynäk., 76:* 1948-1951, 1954.

15066. Pascual del Roncal, F.: Acción del propionato de testosterona (perandren) sobre el estado psíquico de los ancianos. *Rev. Med. Cienc. afines, 9:* 654-685, 1951.

15067. Pearson, S., and T. H. McGavack: The effect of age upon the relative gonadal adrenocortical activity of the male. *J. Geront., 10:* 312-314, 1955.

15068. Raffy, A.: E-vitamin es klimakérium. *Orv. Hetil., 95:* 1213-1216, 1954.

15069. Richter, H. M., J. M. Mora, and D. H. Wagner: One-stage thyroidectomy for thyrotoxicosis in the aged. *Surg. Gynec. Obstet., 69:* 178-182, 1939.

15070. Robinson, A. M.: The excretion of 17-ketosteroids in men of different age-groups with special reference to prostatic cancer. *Brit. J. Cancer, 2:* 13-17, 1948.

15071. Rubin, B. L., R. I. Dorfman, and G. Pincus: 17-ketosteroid excretion in ageing subjects. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 126-140.

15072. Salmon, J. J., R. I. Walters, and S. H. Geist: Use of estrogens in the treatment of dysuria and incontinence in postmenopausal women. *Amer. J. Obstet. Gynec., 42:* 845-851, 1941.

15073. Saxton, J. A., and L. Loeb: Thyroid stimulation and gonadotropic hormones of the human anterior pituitary gland at different ages and in pregnant and lactating women. *Anat. Rec., 69:* 261-279, 1937.

15074. Scheuer, F.: Die klimakterischen Arthrosen. *Münch. med. Wschr., 96:* 1156-1158, 1954.

15075. Schmiemann, R.: Ist eine kausale Behandlung klimakterischer Störungen möglich? *Medizinische, Stuttgart, 41:* 1372-1374, 1954.

15076. Starr, P.: Homeostasis in older people; with special reference to thyroid and adrenal functions in stress. *Geriatrics, 10:* 174-183, 1955.

15077. Starr, P.: Thyroxine therapy in preventive geriatrics. *J. Amer. geriat. Soc., 3:* 217-225, 1955.

15078. Stefensen, K. A.: Albuminuria in diabetes and its relation to age at onset of diabetes. *Danish med. Bull., 1:* 200-203, 1954.

15079. Stoll, P., and H. G. Bach: Zur Bedeutung der Blutung in der Menopause. *Dtsch. med. Wschr., 79:* 1559-1561. 1954

15080. Tapfer, S.: Klimakterische Beschwerden und ihre Behandlung. *Wien. med. Wschr., 105:* 24-28, 1955.

15081. Taylor, W. E., K. Caughran, and B. Hill: Diabetic detection survey during entrance physical examinations at a small college; preliminary report. *J. Lancet, 74:* 247-252, 1954.

15082. Watkins, D. M., J. M. Parsons, M. J. Yiengst, and N. W. Shock: Metabolism in the aged; the effect of stanolone on the retention of nitrogen, potassium, phosphorus, and calcium and on the urinary excretion of 17-keto, 11-oxy, and 17-hydroxy steroids in eight elderly men on high and low protein diets. *J. Geront., 10:* 268-287, 1955.

15083. Zapparoli, G. C.: La menopausa dal punto di vista psicologico. *Riv. sper. Freniat. Antrop., 78:* 297-312, 1954.

See also No. 14932.

VI. Gastro-Intestinal System

15084. Andresen, A. F.: The problem of gall-stones in the aged. *Med. Times, N. Y., 83:* 46-56, 1955.

15085. Bauer, W. H.: Old age changes in human parotid glands with special reference to peculiar cells in uncommon salivary gland tumors. *J. dent. Res., 29:* 685, 1950.

15086. Brotherus, J. V.: Acute appendicitis in old persons. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 560.

15087. Bugyi, B.: (Gastropathies in aged.) *Fogorv. szemle, 47:* 177-180, 1954.

15088. Byrne, R. V.: Diagnosis of polyps of the rectum and colon. *Geriatrics, 10:* 262-264, 1955.

15089. Cavalieri, U.: Le ripercussioni geriatriche degli interventi laparatomici. *Gior. Geront., 3:* 233-238, 1955.

15090. Church, L. E.: Age changes in the nucleus of salivary glands of Wistar Institute rats. *Oral Surg., 8:* 301-314, 1955.

15091. Franzini, C., R. Sorrentino, and P. Mezzetti: Sul comportamento del rapporto citoplasmatico-nucleare determinato su sezioni di fegato di topi albini cancerizzabili seguiti dalla nascita alla senescenza; nota preventiva. *Tumori, 40:* 433-439, 1954.

15092. Glenn, F., and D. M. Hays: The age factor in the mortality rate of patients undergoing surgery of the biliary tract. *Surg., Gynec. Obstet., 100:* 11-18, 1955.

15093. Hiltebrandt, C.: Die Bestimmung der Schlussbisslage zahnloser Kiefer. *Zahnärztl. Welt, 9:* 446-451, 1954.

15094. Karpíšek, J.: (Peptic ulcer in the aged.) *Gastroentegologia, 4:* 22-30, 1950.

15095. Mahlo, A.: Das Altersgeschwür und die Altersgastritis. *Medizinische, Stuttgart, 3:* 105-107, 1955.

15096. Noer, R. J.: Diverticular disease of the colon. *Geriatrics, 10:* 221-224, 1955.

15097. Petra, V.: Zur Klinik und Prognose der Hepatitis epidemica alter Leute. *Z. ges. innere Med., 9:* 1250-1252, 1954.

15098. Schubert, G. E.: Die Appendicitis im höheren Lebensalter. *Med. Klinik, 49:* (46), 1840-1842, 1954.

15099. Seige, K., and G. Klein: Untersuchungen über die Funktion der Ohrspeicheldrüse. II. Mitteilung der Amylasegehalt des Parotissekretes in den verschiedenen Altersstufen. *Z. Altersforsch., 8:* 309-317, 1955.

15100. Southwick, H. W., D. P. Slaughter, and J. A. Bollinger: Idiopathic hypertrophic pyloric stenosis in an elderly adult. *Illinois med. J., 107:* 139-141, 1955.

15101. Tauchi, H., and T. Morikawa: (On the nature of senile atrophy of liver and spleen in comparison with non-senile atrophy.) *Nagoya med. J., 2:* 80-89, 1954. (English summary, pp. 1-12).

15102. Winter, C. C.: Prostatic carcinoma involving the rectum; the problem of differentiation from other malignant lesions. *Calif. Medicine, 82:* 85-90, 1955.

See also Nos. 14934, 15065.

VII. Kidney

15103. Binet, L., C. Laroche, and G. Mathe: Con-

tributo allo studio del rene senile. (Abstract). *Riv. Geront. Geriat., 5:* 28-30, 1955.

15104. Eckerström, S.: The problem of urinary incontinence in old age. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 544-545.

15105. Landi, A.: Il rene nella senescenza del cane. *Gior. Geront., 2:* 539-544, 1954.

15106. Olbrich, O., and D. Webster: Renal function in prostatism. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 545-546.

15107. Thung, P. J.: Age changes in the mouse kidney. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 150-154.

15108. Verzár, F.: Compensatory hypertrophy of kidney and adrenal in the lifespan of rats. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 139-150.

VIII. Lymphatic System

15109. Silberberg, M., and R. Silberberg: Role of age in estrogen-induced lymphoid tumors of mice. *Arch. Path., Chicago, 47:* 340-349, 1949.

15110. Oakberg, E. F.: Distribution and amount of lymphoid tissue in some of the splanchnic nerves of chickens in relation to age, sex, and individual constitution. *Poult. Sci., 29:* 420-436, 1950.

IX. Muscular System

15111. Bick, E. M.: The physiology of the aging process in the musculoskeletal apparatus. *Geriatrics, 10:* 274-277, 1955.

15112. Gerstle, M., Jr.: Myasthenia gravis; remarks on age incidence; report of a case. *Calif. west Med., 30:* 113-114, 1929.

15113. Hiner, R. L., and O. G. Hankins: The tenderness of beef in relation to different muscles and age of the animal. *J. Anim. Sci., 9:* 347-353, 1950.

15114. Schiavetti, L., and E. Cerimele: Fisiopatologia del muscolo striato nelle malattie reumatiche. *Reumatismo, Milano, 6:* 38-47, 1954.

15115. Schwarz, G. A., and G. King: Neuromuscular diseases of later maturity. Part I. *Geriatrics, 10:* 197-207, 1955.

15116. Wilson, G. D., R. W. Bray, and P. H. Phillips: The effect of age and grade on the collagen and elastin content of beef and veal. *J. Anim. Sci., 13:* 826-831, 1954.

See also No. 15489.

X. Nervous System

(neurology)

15117. Bahov, J.: Un cas de maladie de Parkinson guéri. *Lyon méd., 86:* 361-363, 1954.

15118. Barlen, F.: Die Behandlung des Parkinsonismus mit einem neuen Belladonna-Alkaloid. *Medizinische, Stuttgart, 7:* 254-255, 1955.

15119. Berris, H.: Parkinsonism; preliminary report on two new antiparkinsonian agents. *J. Lancet, 74:* 245-246, 1954.

15120. Brain, W. R.: Cerebral lesions in old age. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 395-401.

15121. Brisotto, P.: Incoordinazione accessuale senile di riflessi al guigulo. *Minerva otorinolar., Torino, 4:* 293-295, 1954.

15122. Brody, H.: Organization of the cerebral cortex. III. A study of aging in the human cerebral cortex. *J. comp. Neurol., 102:* 511-556, 1955.

15123. Browder, E. J., and H. A. Kaplan: Concerning the neural mechanism of Parkinsonian tremor. *J. Neurosurg., 11:* 578-582, 1954.

15124. Cavalieri, U.: Le malattie del sistema nervoso senile. *Longevità, 4:* (4), 3-12, 1954.

15125. de Leonardis, L.: Il pigmento giallo del piede della terza circonvoluzione frontale nelle varier età della vita. *Monit. zool. ital., 56:* (Suppl), 264-266, 1948.

15126. Droller, H.: Deaths and survivals of elderly patients suffering from hemiplegia. *Med. Pr., —:* 514-516, June 1, 1955.

15127. Eitinger, L.: Presenile dementia (Alzheimer's and Pick's diseases). *Acta psychiat. Neur. scand., 29:* 411-421, 1954.

15128. Fazekas, J. F., J. Kleh, and F. A. Finnerty: Influence of age and vascular disease on cerebral hemodynamics and metabolism. *Amer. J. Med., 18:* 477-485, 1955.

15129. Godina, G.: Mutamenti dei neuroni dei gangli simpatici di animali domestict durante l'accrescimento e nella senescenza. *Monit. zool. ital., 57:* (Suppl.), 83-86, 1950.

15130. Graves, J., and H. E. Himwich: Age and the water content of rabbit brain parts. *Amer. J. Physiol., 179:* 205-208, 1954.

15131. Halliday, G. G.: Parkinson's diseases. *J. Kans. med. Soc., 55:* 721-730, 1954.

15132. Kuhlenbeck, H.: Some histologic age changes in the rat's brain and their rela-

tionship to comparable changes in the human brain. *Confinia neurologica, Basel, 14:* 329-342, 1954.

15133. Morgurgo, M., C. Serra, and G. Mars: Sull 'analisi comparativa dei dati elettroencefalografici ed elettrocardiografici in pazients di età senile. *Minerva med., Roma, 46:* 361-364, 1955.

15134. Muller, O. H.: The effect of age on the protein concentration of cerebrospinal fluid of "normal" individuals and patients with poliomyelitis and other diseases. *Amer. J. med. Sci., 5:* 510, 1954.

15135. Mundy-Castle, A. C.: An analysis of central responses to photic stimulation in normal adults. *EEG clin. Neurophysiol., 5:* 1-22, 1953. *Abstr: P. A., 29:* No. 1927, 1955.

15136. Nielsen, J. M., and S. L. Marvin: Parkinsonism and trauma. *Bull. Los Angeles neurol. Soc., 19:* 193-196, 1954.

15137. Obrist, W. D., and L. F. Bissell: The electroencephalogram of aged patients with cardiac and cerebral vascular disease. *J. Geront., 10:* 315-330, 1955.

15138. Pampiglione, G., and F. Post: The value of electroencephalographic examination in elderly psychiatric patients with suspected brain lesions. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 430-433.

15139. Robinson, R. A.: The correlation between EEG abnormality and senile arteriosclerotic organic deterioration. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 433-437.

15140. Rossini, R., R. Reggiani, and G. Zanocco: Rilievi elettroencefalografici nell'atrofia cerebrale. *Riv. Patol. nerv. ment., 75:* 378-390, 1954.

15141. Rusk, H. A.: Early management of the paraplegic patient. *U. S. Armed Forces med. J., 6:* 157-161, 1955.

15142. Russell, W. R.: Diseases of the spinal cord and peripheral nerves in old people. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 401-403.

15143. Sack, H., and H. G. Handrick: Zur Pathogenese und Therapie des Schlaganfalles. *Medizinische, Stuttgart, 1:* 12-21, 1955.

15144. Schwab, R. S., M. E. Chafetz, and S. Walker: Maintaining two voluntary motor activities at the same time; normal values and its impairment in Parkinson's disease. *Trans. Amer. neurol. Ass., (79th Meet.), —:* 216-220, 1954.

15145. Schwab, R. S., and E. M. Chapman: The value of depressing with radioactive iodine the thyroid function of selected patients with Parkinson's disease. *Trans. Amer. neurol. Ass., (79th Meet.), —:* 117-121, 1954.

15146. Shimoda, Y., N. Hanazono, A. Koizumi, A. Murakami, K. Kodowaki, and T. Tanaka: EEG changes and age factor. II. The frequency analysis, topographical abnormality and paroxysmal discharges on the EEG of normal children in from 4 to 15 years of age. *Folia psychiat. neurol. japon., 8:* 202-203, 1954.

15147. Silverman, A. J., E. W. Busse, and R. H. Barnes: Studies in the processes of aging; electroencephalographic findings in 400 elderly subjects. *EEG clin. Neurophysiol., 7:* 67-74, 1955.

15148. Sjöqvist, O.: Surgery in Parkinson's disease. *Zbl. Neurochir., 14:* 16-21, 1954.

15149. Sulkin, N. M.: The occurrence, distribution and nature of PAS-positive substances in the nervous system of the senile dog. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 156-157.

15150. Vogt, C., and O. Vogt: Über Wesen und Ursache des Alterns der Hirnzelle. *Forsch. Fortschr. dtsch. Wiss., 21-23:* 61-62, 1947.

15151. Weihs, E.: Zur Euphyllinbehandlung der Apoplexie. *Dtsch. med. Wschr., 79:* (40), 1493, 1954.

15152. Wesselius, L. F.: Psychotherapy in the treatment of organic brain disorder following cerebral vascular accident. *Bull. Menninger Clin., 18:* 97-106, 1954. *Abstr: P. A., 29:* No. 2912, 1955.

15153. Winter, R.: Euphyllin zur Behandlung des Schlaganfalles in der täglichen Praxis. *Wien. med. Wschr., 105:* 37-38, 1955.

15154. Ziegler, D. K., and F. Torres: Parsidol in the treatment of Parkinsonism. *Neurology, 5:* 197-200, 1955.

15155. Zier, A., and L. J. Doshay: Treatment of Parkinsonism with pagitane hydrochloride; results in 142 patients. *Neurology, 4:* 682, 1954.

15156. Anonymous: Stellate ganglion block and apoplexy. *J. Amer. med. Ass., 157:* 1219, 1955.

See also Nos. 15110, 15500.

XI. Reactions of the Body as a Whole

(allergy, anoxia, anesthesia, anthropometry, drugs, exercise, immunity, sleep, and temperature regulation)

15157. Åstrand, P.-O.: A study of capacity for hard

muscular work of 17 to 19-year-old male youths. *Arbeitsphysiologie, 15:* 251-254, 1953.

15158. Ausherman, H. M.: Anesthesia for the elderly patient. *Sth. med. J., Birmingham, 48:* 130-134, 1955.

15159. Boehmig, A.: Konstitutionstypen und Altersleistungen beim Sport. *Dtsch. med. Wschr., 79:* (36), 1344-1346, 1954.

15160. Boehmig, A.: Über Gewichts- und Alters klasseneinteilung. *Dtsch. med. Wschr., 80:* (5), 194-195, 1955.

15161. Brabetz, V.: Was kann das Cytotoxische Serum leisten? *Hippokrates, 25:* (19), 620-621, 1954.

15162. de Félice, S.: Recherches sur l'anthropologie des Françaises. *C. R. Acad. Sci., Paris, 239:* 1317-1319, 1954.

15163. Dodd, R. B.: Anesthesia for the elderly. *Amer. Surg., 21:* 262-267, 1955.

15164. Dublin, L. I.: The influence of weight on certain causes of death. *Hum. Biol., 2:* 159, 1930.

15165. Dublin, L. I., and H. H. Marks: Mortality of women according to build — experience in standard issues. *Proc. Amer. life Insur. Med. Dir., 25:* 203, 1939.

15166. Flach, A., and G. Voss: Über die Curarisierung im höheren Alter. *Chirurg., 25:* 514-517, 1954.

15167. Flückiger, E., and F. Verzár: Lack of adaptation to low oxygen pressure in aged animals. *J. Geront., 10:* 306-311, 1955.

15168. Garn, S. M., and R. V. Harper: Fat accumulation and weight gain in the adult male. *Hum. Biol., 27:* 39-49, 1955.

15169. Gaustad, V.: (Insomnia in aged.) *Tidssk. norske LaegeForen., 74:* 743-744, 1955.

15170. Gonzáles Cruz, A.: Modificaciones de la presión venosa con el esfuerzo en personas sanas de edad geriátrica. *Med. esp., 32:* 124-129, 1954.

15171. Gonzáles Cruz, A.: El indice de Schneider y el producto amplitud-frecuencia en personas sanas de edad geriátrica. *Med. esp., 32:* 271-275, 1954.

15172. Gross, L.: Susceptibility of suckling-infant, and resistance of adult, mice of the C3H and of the C57 lines to inoculation with AK leukemia. *Cancer, 3:* 1073-1087, 1950.

15173. Hirschman, G. E.: Anesthesia problems in the geriatric patient. *J. Amer. osteop. Ass., 54:* 284-288, 1955.

15174. Hollcroft, J. W., E. Lorenz, M. Matthews, and C. C. Congdon: Long-term survival following X irradiation and the irradiation of the α particles from radon and its decay products. *J. nat. Cancer Inst., 15:* 1059-1069, 1955.

15175. Johnson, J. B.: The problem of the aging face. *Plastic & Reconstr. Surg., 15:* 117-121, 1955.

15176. Koons, R. A.: Anesthetic management of the aged for fractured hip surgery. *Geriatrics, 10:* 225-228, 1955.

15177. Kornfeld, W.: Neuere Durchschnittswerte für die anthropometrische Analyse von Körperbau und Entwicklung. *Öster. Z. Kinderheilk. u. Kinderfür., 10:* 71-88, 1954.

15178. Lehr, D.: Problems of chemotherapy in the older age group. *J. Amer. geriat. Soc., 3:* 355-366, 1955.

15179. Maguire, R. X., and K. A. Merendino: Effect of age on mechanism of death and ability to tolerate acute hypothermia in dog. *Arch. Surg., Chicago, 70:* 367-373, 1955.

15180. Master, A. M., and H. L. Jaffe: Physiologic effects of obesity upon the heart; the incidence of obesity in coronary disease. *J. Amer. geriat. Soc., 3:* 299-305, 1955.

15181. Norris, A. H., and N. W. Shock: Age differences in the efficiency of manual exercise in males. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 214-220.

15182. Pett, L. B.: A Canadian table of average weights. *Canad. med. Ass. J., 72:* 12-14, 1955.

15183. Rosenbaum, S.: Heights and weights of the army intake. *J. roy. statist. Soc., 117:* 331-347, 1954. *Abstr: P. I., 21:* No. 2219, 1955.

15184. Saxen, E. A.: On the factor of age in the production of subcutaneous sarcomas in mice by 20-methylcholanthrene. *J. nat. Cancer Inst., 14:* 547-569, 1953.

15185. Sheldon, W. A.: *Atlas of men; a guide for somatotyping the adult male at all ages.* Harper & Brothers, N. Y., 1954, xvi, 357 pp. *Abstr: P. A., 29:* No. 1908, 1955.

15186. Skerlj, B.: Further evidence of age changes in body form based on material of D. A. W. Edwards. *Hum. Biol., 26:* 330-336, 1954.

15187. Springer, E.: Zur Praxis und Theorie der Bogomoletzkuren; Erfahrungen mit CSB (Cytotoxisches Serum Berna bei Chronischkranken in der Anstalt). *Praxis, 43:* 1022-1025, 1954.

15188. Trotter, M.: Adjustment for ageing in stature estimates from long bones. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 155.

15189. Upton, A. C., and J. Furth: Spontaneous and radiation-induced pituitary adenomas of

mice. *J. nat. Cancer Inst., 15:* 1005-1021, 1955.

15190. Verzár, F., and E. Flückiger: Lack of adaptation to low oxygen pressure in aged animals. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 524-532.

15191. Wittich, F. W.: Respiratory allergies and their modifications in patients over 45 years of age. *J. Amer. geriat. Soc., 3:* 239-247, 1955.

15192. Anonymous: La resistenza dell'obeso alla diminuzione di peso. *Acta geront., 4:* 192-194, 1954.

See also Nos. 14902, 14935, 15038.

XII. Reproductive System

(ovaries, testis, see Endocrine System)

15193. Bash, W. H.: Differential fertility in Madison County, New York; 1865. *Milbank mem, Fd. quart. Bull., 33:* 161-186, 1955.

15194. Eddy, R. W.: Gynecology in the elderly patient. *Ohio St. med. J., 44:* 1210-1212, 1948.

15195. Gause, R. W.: Geriatric gynecology at the New York Hospital. *Obstet. Gynec., 5:* 423-430, 1955.

15196. Heady, J. A., C. Daly, and J. N. Morris: Social and biological factors in infant mortality. II. Variation of mortality with mother's age and parity. *Lancet, 1:* 395-397, 1955.

15197. Heady, J. A., C. F. Stevens, C. Daly, and J. N. Morris: Social and biological factors in infant mortality. IV. The independent effects of social class, region, the mother's age and her parity. *Lancet, 1:* 499-503, 1955.

15198. McCullough, M.: Vaginal plug for procidentia in elderly women. *Lancet, 1:* 491, 1955.

15199. Mace, J., Jr., and L. Maryanov: Myomatous uterus in an elderly multigravida. *Maryland med. J., 4:* 18-20, 1955.

15200. Morris, J. M.: Gynecologic carcinoma in the older patient. *J. Amer. geriat. Soc., 3:* 259-269, 1955.

15201. Mühlbock, O.: Hypertrophy of secondary sex organs in old female mice. *In:* 3rd Cong. Int. Assoc. Geront.. London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 199-202.

15202. Ortavant, R.: Contribution a l'étude de la durée du processus spermatogénétique du Bélier a l'aide du ^{32}P. *C. R. Soc. Biol., Paris, 148:* 804-806, 1954.

15203. Peretz, A., and K. Fuchs: Pregnancy and delivery in elderly primiparae. *Harefuah, 48:* (2), 23-26, 1955.

15204. Piccioni, V.: Il parto nelle primipare attempate. *Clin. Ostet. Ginec., 56:* 249-267, 1954.

15205. Williamson, P. J., and C. H. Lake: The elderly primipara. *Obstet. Gynec., 5:* 37-42, 1955.

XIII. Respiratory System

15206. Bates, D. V., and R. V. Christie: Effects of ageing on respiratory function in man. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 58-68.

15207. Bour, H.: Remarques sur le poumon des viellards. *Concours méd., 77:* 439-440, 1955.

15208. Cade, R., and W. F. Miller: A comparison of the effects of intermittent positive pressure (IPPB), bronchodilators alone, and IPPB plus nebulized bronchodilators in patients with chronic pulmonary disease. *Proc. clin. Res., 2:* 135, 1954.

15209. Ferris, B. G., Jr., and C. W. Smith: Maximum breathing capacity and vital capacity in female children and adolescents. *Pediatrics, 12:* 341-352, 1953.

15210. Fleischhans, B., M. Neumann, J. Klíma, V. Bárta, V. Kvasnička, and M. Maxa: (Chronic bronchitis and pulmonary emphysema in farmers.) Čas. Lék. čes., *94:* 158-163, 1955.

15211. Fowler, W. S., H. F. Helmholz, Jr., and R. D. Miller: Treatment of pulmonary emphysema with aerosolized bronchodilator drugs and intermittent positive pressure breathing. *Proc. Mayo Clin., 28:* 743, 1953.

15212. Fry, D. L., R. V. Ebert, W. W. Stead, and C. C. Brown: The mechanics of pulmonary ventilation in normal subjects and in patients with emphysema. *Amer. J. Med., 16:* 80-97, 1954.

15213. Goudriaan, J. C.: The treatment of bronchopneumonia in the aged. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 552-555.

15214. Graimprey, J.: Les valeurs dites normales en spirographie. *Rev. méd. Nancy, 79:* 648-657, 1954.

15215. Great Britain. Ministry of Health: *Mortality and morbidity during the London fog of December 1952.* H. M. Stationery Office, London, Rpts. Publ. Hlth. & Med. Subjects, 1954, No. 95. *Abstr: P. I., 21:* No. 2115, 1955.

15216. Grosse, H.: Über die Häufigkeit der letalen Tuberkulose beim Erwachsenen. *Beitr. Klin. Tuberk., 112:* 121-130, 1954.

15217. Hastings, O. L.: Intermittent positive pressure breathing in chronic diseases of the lung; the A. D. Becker Memorial Lecture, 1954. *J. Amer. osteop. Ass., 54:* 349-351, 1955.

15218. Ingegnieros, S., M. Repaci, and L. Vergani: Reazione anticorpale nei soggetti anziani in seguito a vaccinazione anti-influenzale. (Abstract). *Gior. Geront., 3:* 181-182, 1955.

15219. Motley, H. L., and R. H. Smart: Pulmonary emphysema; physiologic factors in diagnosis and advances in therapy. *J. Amer. geriat. Soc., 3:* 316-329, 1955.

15220. Needham, C. D., M. C. Rogan, and I. McDonald: Normal standards for lung volumes, intrapulmonary gas-mixing, and maximum breathing capacity. *Thorax, 9:* 313-325, 1954.

15221. Ragaini, S., and F. Mandler: Ulteriori rilievi anatomo-patologici sulla frequenza della tubercolosi senile. *Osped. maggiore, 42:* 366-373, 1954.

15222. Riley, R. L., A. Himmelstein, H. L. Motley, H. M. Weiner, and A. Cournand: Studies on the pulmonary circulation at rest and during exercise in normal individuals and in patients with chronic pulmonary disease. *Amer. J. Physiol., 152:* 372, 1948.

15223. Sartorelli, E., and S. Ingegnieros: Valutazione della funzionalità respiratoria nei soggetti anziani mediante l'ossimetria arteriosa in lavoro. (Abstract). *Gior. Geront., 3:* 181, 1955.

15224. Sartorelli, E., S. Ingegnieros, and G. Martelli: Sulla frequenza e gravità dell'enfisema polmonare senile. *Gior. Geront., 3:* 129-136, 1955.

15225. Scarrone, L. A., R. Levin, and A. L. Barach: Variations in the vital-capacity measurement in patients with bronchial asthma and pulmonary emphysema. *N. Engl. J. Med., 252:* (2), 57-59, 1955.

15226. Simpson, T.: Acute respiratory infections in emphysema; an account of 118 cases. *Brit. med. J., 1:* 297, 1954.

15227. Tala, P., M. J. Karvonen, J. Pätiälä, and J. V. Lieto: Normal values for vital capacity and maximum breathing capacity in Finnish subjects. *Ann. Med. intern. Fenniae, Helsinki, 43:* 270-280, 1954.

15228. Wilson, R. H., W. Hoseth, and M. E. Dempsey: The effects of breathing 99.6% oxygen on pulmonary vascular resistance and cardiac output in patients with pulmonary emphysema and chronic hypoxia. *Ann. intern. Med., 42:* 629-637, 1955.

15229. Yamada, N., and K. Tatai: Vital capacity, maximum breathing capacity and maximum breathing rate in healthy male adults. *Jap. J. Physiol., 4:* 246-250, 1954.

See also No. 15206.

XIV. Sense Organs and Perception

15230. Boles-Carenini, B.: Del comportamento del senso cromatico in relazione all'età. *Ann. Ottalm. clin. Ocul., 80:* 451-458, 1954.

15231. Covell, W. P.: Noise-induced hearing loss and presbycusis. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 403-409.

15232. Droller, H., and J. Pemberton: Vertigo in a random sample of elderly people living in their homes. *J. Laryng., 67:* 689, 1953.

15233. Forsius, H.: Arcus senilis corneae; its clinical development and relationship to serum lipids, proteins and lipoproteins. *Acta ophthal., Kbh., —:* (42), 1-78, 1954.

15234. Friedman, A. P.: Headache; diagnosis and treatment. *J. Amer. geriat. Soc., 3:* 399-415, 1955.

15235. Goldhan, U.: Exophthalmometerwerte und Lebensalter. *Z. Altersforsch., 8:* 365-369, 1955.

15236. Lange, F.: Über die Pupillomotorik im Alter. *Klin Mbl. Augenheilk., 124:* 76, 1954.

15237. Lavagna, L: Cataratta e senescenza. (Abstract). *Riv. Geront. Geriat., 5:* 31-32, 1955.

15238. Leydhecker, W., and P. Niesel: Statistische Berechnung der physiologischen Grenzwerte bei Glaukom-Belastungsproben. *Klin. Mbl. Augenheilk., 125:* 458-467, 1954.

15239. Mitsui, Y., C. Tanaka, and K. Yamashita: Changes in the constitution with age. Its influence on the clinical symptoms of conjunctivitis. *Amer. J. Ophthal., 39:* 540-546, 1955.

15240. Orma, E.: Vertigo and dizziness in old people. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 409-412.

15241. Siirala, U.: Über den Bau und die Funktion des Ductus und Saccus endolymphaticus bei alten Menschen. *Z. Anat. EntiwGesch., 111:* 246-265, 1942.

15242. Szafran, J.: Experiments on the greater use of vision by older adults. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 231-235.

See also Nos. 15258, 15477.

XV. Skeletal System

15243. Anderson, T. P.: Management of degenerative joint disease of the knee. *Arch. phys. Med., 36:* 154-159, 1955.

15244. Cugurra, F.: Sullo studio della permeabilità articolare *in vivo. Arch. ital. Sci. Farmacol., 4:* 277-282, 1954.

15245. Flemming, C.: Orthopaedic surgery in the elderly. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 560-562.

15246. Scaglietti, O: Lombo-arthrite et lombosciatalgie. *Acta orthopaed. belg., 20:* 372-385, 1954.

15247. Warren, M. W.: The management of the elderly double amputee. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 562-570.

See also No. 15397.

XV-A. Skeletal System: *Bone*

15248. Barnes, L. L., and C. M. McCay: Bone tumours by radioactive calcium. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 180.

15249. Bohatirchuk, F.: Macro-roentgenographical and histo-roentgenographical (micro-radiographical) data on the adaptation of human skeleton to the ageing of the body. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 155-156.

15250. Ciarpaglini, L.: Considerazioni attuali e rilievi intorno alla malattia ossea di Paget. *Radiolog. med., 40:* 976-1106, 1954.

15251. Cobb, W. M.: The age incidence of suture closure. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 155.

15252. Deakins, M. L.: Changes in the composition of bone with age. *J. dent. Res., 27:* 758, 1948.

15253. Doberauer, W.: Ergebnisse genagelter Schenkelhalsbrüche bei Menschen hohen Alters. *Klin. Med., Wien, 9:* 381-390, 1954.

15254. Henschen, F.: Il cranio del vecchio nell'uomo e nella donna. *Riv. Geront. Geriat., 5:* 1-17, 1955.

15255. Hunter, R. B.: Prognosis for fractured hips in aging people. *Northw. Med., Seattle, 54:* 265-266, 1955.

15256. Knese, K. H., D. Voges, and I. Ritschl: Untersuchungen über die Osteon-und Lamellenformen in Extremitätenskelet des Erwachsenen. *Z. Zellforsch., 40:* 323-360, 1954.

15257. Pañella-Casas, M., J. Monteys, D. Ferrer, F. Manchon, and G. Hernandez: Osteoporose sénile. *Concours méd., 77:* 436-439, 1955.

15258. Pietruschka, G.: Zur Frage der Augenveränderungen bei der Ostitis deformans Paget in Beziehung zur Arteriosklerose. *Klin. Mbl. Augenheilk., 125:* 171-183, 1954.

15259. Schrage, W.: Beitrag zur hormonalen Therapie des Morbus Paget. *Medizinische, Stuttgart, 1:* 46-47, 1955.

15260. Stewart, T. D. Metamorphosis of the joints of the sternum in relation to age changes in other bones. *Amer. J. phys. Anthrop., 12:* 519-535, 1954.

XV-E. Skeletal System: *Arthritis and Rheumatism**

15261. Ball, J.: Rheumatoid arthritis and polyarthritis nodosa. *Ann. rheumat. Dis., 13:* 277-290, 1954.

15262. Borkenhagen, R., and A. Elfenbaum: Dentine dysplasia associated with rheumatoid arthritis and hypervitaminosis D. *Oral Surg., 8:* 76-81, 1955.

15263. Caramanian, M. K.: Polyarthrities aiguës et infections des voies respiratories supérieures; la prophylaxie. *Sem. Hôp. Paris, 31:* 490-500, 1955.

15264. Castelli, D., and V. Daneo: Sul comportamento del complemento e delle sue frazioni nell'artrite reumatoide e sui suoi rapporti col fattore emoagglutinate. *Reumatismo, Milano, 6:* 346-355, 1954.

15265. Cobb, S., W. R. Merchant, and J. E. Warren: An epidemiologic look at the problem of classification in the field of arthritis. *J. chronic Dis., 2:* 50-54, 1955.

15266. Coulon, R., R. Charlier, and L. Vandersmissen: Action de la cystéinamine sur une *codyn., 99:* 474-480, 1954.

15267. Daneo, V., and G. Einaudi: Comportamento dei polisaccaridi proteici nelle malattie reumatiche. *Reumatismo, Milano, 6:* 316-321, 1954.

15268. Dresner, E.: Aetiology and pathogenesis of rheumatoid arthritis. *Amer. J. Med., 18:* 74-111, 1955.

15269. Ebaugh, F. G., Jr., R. E. Peterson, G. P. Rodnan, and J. J. Bunim: The anemia of rheumatoid arthritis. *Med. Clin. N. Amer., —:* 489-498, March 1955.

15270. Gamp, A., E. J. Kirnberger, and A. Bopp: Untersuchungen über Kreatin-Stoffwechsel-

*Selected references.

störungen bei chronischem Gelenkrheumatismus. *Z. Rheumaforsch., 13:* 387-394, 1954.

15271. Gamp, A., and H. Oswald: Das Bluteiweissbild in der klinischen Beurteilung chronisch rheumatischer Erkrankungen. *Z. klin. Med., 151:* 397-406, 1954.

15272. Gedda, P. O.: On amyloidosis and other causes of death in rheumatoid arthritis. *Acta med. scand., 150:* 443-452, 1955.

15273. Houli, J., and H. Monteiro Marinho: Bone marrow in rheumatoid arthritis. *Ann. rheumat. Dis., 13:* 327-330, 1954.

15274. Jawetz, E., and E. V. Hook: Differential sheep cell agglutination test in rheumatoid arthritis. *Proc. Soc. exp. Biol., N. Y., 70:* 650-653, 1949.

15275. Jones, R. S., V. Carter, and J. DeW. Rankin: Rheumatic-like lesions in the guinea-pig; a correlation of toxic, anaphylactogenic, anthropathic and chemical properties of certain crude polysaccharides from Klebsiella pneumoniae type B. *Brit. J. exp. Path., 35:* 519-527, 1954.

15276. Kalliomäki, L.: Correlation of the erythrocyte sedimentation rate and gold complications in rheumatoid arthritis. *Ann. rheumat. Dis., 13:* 336-337, 1954.

15277. Lloyd-Roberts, G. C.: Osteoarthritis of the hip; a study of the clinical pathology. *J. Bone Jt. Surg., Brit. Ed., 37-B:* (1), 8-47, 1955.

15278. Ludwig, A. O.: Psychiatric considerations in rheumatoid arthritis. *Med. Clin. N. Amer., —:* 447-458, March 1955.

15279. Mathieu, P. W., J. Delarue, and V. Barré: Aux confins du rhumatisme et de la goutte; une banale histoire d'arthrite du poignet. *Rev. Rhumat., Paris, 21:* 693-694, 1954.

15280. Mettier, S. R.: Rheumatoid arthritis; diagnosis in peripheral joint affliction. *Calif. Medicine, 82:* 181-185, 1955.

15281. O'Neill, D.: Discussion on psychogenic rheumatism. *Proc. roy. Soc. Med., 48:* 65-66, 1955.

15282. Pike, R. M., S. E. Sulkin, and H. C. Coggeshall: The hemagglutination test for rheumatoid arthritis. *Med. Clin. N. Amer., —:* 379-391, March 1955.

15283. Pohl, W.: Klinische Beobachtungen über nervale Einflüsse beim Rheumatismus. *Med. Klinik, 49:* 1686-1689, 1954.

15284. Polley, H. F.: The diagnosis and treatment of rheumatoid spondylitis. *Med. Clin. N. Amer., —:* 509-528, March 1955.

15285. Ravina, A.: Conceptions modernes sur la prophylaxie du rhumatisme articulaire aigu. *Pr. méd., 63:* 3-4, 1955.

15286. Reynolds, W. E., and C. L. Short: The clinical manifestations of rheumatoid arthritis. *Med. Clin. N. Amer., —:* 365-577, March 1955.

15287. Robecchi, A., and V. Daneo: Observations cliniques et expérimentales sur la réaction de Waaler-Rose en rhumatologie. *Rev. Rhumat., Paris, 21:* 829-840, 1954.

15288. Saxl, A.: Arthritis und spastische Gelenkskontraktur. *Wien. klin. Wschr., 66:* 688-691, 1954.

15289. Scharff, O., and R. Pohl: Zur Pathogenese und Therapie der Periarthritis humeroscapularis. *Wien. klin. Wschr., 66:* 688-691, 1954.

15290. Scholz, H., and C. Steffen: Die Bedeutung der Reaktionslage des Organismus für die Entwicklung und die Therapie der rheumatischen Gelenkserkrankungen. *Klin. Med., Wien., 9:* 479-492, 1954.

15291. Scopinaro, D., R. Rivano, and S. Solari: Quelques aspects des perturbations du métabolisme musculaire dans la polyarthritie chronique évolutive. *Rev. Rhumat., Paris, 21:* 841-845, 1954.

15292. Serra-Peralba, A., and P. Barcelo: La permeabilidad capilar en las afecciones reumáticas. *Rev. esp. Reumat., 5:* 363-367, 1954.

15293. Stecher, R. M.: Hereditary factors in arthritis. *Med. Clin. N. Amer., —:* 499-508, March 1955.

15294. Sundt, P. E.: Discussion on psychogenic rheumatism. *Proc. roy. Soc. Med., 48:* 66, 1955.

15295. Tegner, W.: Discussion on psychogenic rheumatism. *Proc. roy. Soc. Med., 48:* 69-70, 1955.

15296. Toussant, J., and G. Gaudin: Auto-sensibilitsation et polyarthrities chroniques. *Rev. Rhumat., Paris, 21:* 880-881, 1954.

15297. Vorlaender, K. O., W. Fitting, and H. Blankenheim: Auto-Allergie und Rheumatismus. *Z. Rheumaforsch., 13:* 276-296, 1954.

15298. Wahl, R.: Polyarthrites aiguës et infections des voies respiratories supérieures; streptocoques et rhumatismes. *Sem. Hôp. Paris, 31:* 479-484, 1955.

15299. Wilson, H., R. Fairbanks, C. McEwen, and M. Ziff: Studies on the metabolism of adrenal cortical steroids in the synovial cavity in rheumatoid arthritis. *Ann. N. Y. Acad. Sci., 61:* (Art. 2), 502-510, 1955.

15300. Zhekov, S.: Chronic arthritis following Salmonella toxin infection.) *Suvrem. med., 5:* 70-74, 1954.

15301. Ziff, M., J. Simson, E. Sculle, A. Smith, J. Shatton, and D. Mainland: Aminotripepti-

dase content of synovial fluid in arthritic diseases. *J. clin. Invest., 34:* 27-34, 1955.

15302. Anonymous: (Activities of the Seventh International Congress on Rheumatism.) *Klin. med., Mosk., 32:* 9-18, 1954.

XV-E. Skeletal System: *Arthritis and Rheumatism Therapy**

15303. Bilka, P. J., and M. H. Weil: Gold-hormonal therapy in rheumatoid arthritis. *Ann. intern. Med., 42:* 638-643, 1955.

15304. Bohman, F.: Gold treatment in rheumatoid arthritis with some notes on hormone-gold and hormone-salazopyrin therapy. *Acta genet., Basel, 5:* (Suppl.), 1-164, 1954.

15305. Boland, E. W.: Present status of hydrocortisone as a therapeutic agent in rheumatoid arthritis. Part II. Use of cortisone, hydrocortisone, and certain synthetic steroids in systemic diseases. *Ann. N. Y. Acad. Sci., 61:* (Art. 2), 349-357, 1955.

15306. Boland, E. W.: Experiences with 9-alpha-fluorohydrocortisone acetate in rheumatoid arthritis. *Ann. N. Y. Acad. Sci., 61:* (Art 2), 591-598, 1955.

15307. Boland, E. W., and N. E. Headley: Preliminary clinical trials with 9-alpha-fluoro hydrocortisone acetate in rheumatoid arthritis. *Ann. rheumat. Dis., 13:* 291-296, 1954.

15308. Bollet, A. J., and J. J. Bunim: The importance of serial joint x-rays in the evaluation of treatment of rheumatoid arthritis. *Med. Clin. N. Amer., —:* 439-445, March 1955.

15309. Bunim, J. J., R. L. Black, A. J. Bollet, and M. M. Pechet: Metabolic effects of metacortandralone and metacortandracin. *Ann. N. Y. Acad. Sci., 61:* (Art. 2), 358-368, 1955.

15310. Bunim, J. J., M. M. Pechet, and A. J. Bollet: Studies on metacortandralone and metacortandracin in rheumatoid arthritis; antirheumatic potency, metabolic effects, and hormonal properties. *J. Amer. med. Ass., 157:* 311, 1955.

15311. Bunim, J. J., M. Ziff, and C. McEwen: Evaluation of prolonged cortisone therapy in rheumatoid arthritis; a four-year study. *Amer. J. Med., 18:* 27-40, 1955.

15312. Dillon, R. N., and J. J. Majnarich: Rheumatoid arthritis. II. Specific therapy. *Northw. Med., Seattle, 54:* 156-161, 1955.

15313. Duff, I. F., W. D. Robinson, W. M. Mikkelsen, and N. H. Chatelin: Intra-articular hydrocortisone in rheumatoid arthritis; clinical and laboratory studies. *Med. Clin. N. Amer., —:* 413-437, March 1955.

15314. Erlsbacker, O., A. Papp, and H. Geisberger: Beiträge zur Stickstofflostbehandlung. I. Die Stickstofflostbehandlung akuter und chronischer Gelenksaffektionen. *Klin. Med., Wien, 9:* 410-416, 1954.

15315. Frankl, R., and G. Golz: Durchblutungsförderung und Gefässabdichtung als Therapie rheumatischer Prozesse. *Medizinische, Stuttgart, 40:* 1361-1362, 1954.

15316. Golz, G.: Behandlungsergebnisse des chronischen Rheumatismus mit Butazolidin. *Medizinische, Stuttgart, 44:* 1480-1482, 1954.

15317. Gray, J. W., and E. Z. Merrick: The clinical evaluation of meticorten in rheumatoid arthritis and allied conditions. *J. Amer. geriat. Soc., 3:* 337-344, 1955.

15318. Gutman, A. B., and T. F. Yü: Prevention and treatment of chronic gouty arthritis. *J. Amer. med. Ass., 157:* 1096-1102, 1955.

15319. Herzog, H. L., A. Nobile, S. Tolksdorf, W. Charney, E. B. Hershberg, P. L. Perlman, and M. M. Pechet: New antiarthritic steroids. *Science, Wash., 121:* 176, 1955.

15320. Hill, D. F.: Basic treatment in rheumatoid arthritis. *Med. Clin. N. Amer., —:* 393-403, March 1955.

15321. Holbrook, W. P.: Cortisone, ACTH and phenylbutazone in long-term therapy of rheumatoid arthritis. *Med. Clin. N. Amer., —:* 405-412, March 1955.

15322. Hollander, J. L.: The use of intra-articular hydrocortisone; its analogs, and its higher esters in arthritis. *Ann. N. Y. Acad. Sci., 61:* (Art. 2), 511-516, 1955.

15323. Hollander, J. L., E. M. Brown, Jr., R. A. Jessar, L. Udell, N. Smukler, and M. A. Bowie: Local anti-rheumatic effectiveness of higher esters and analogues of hydrocortisone. *Ann. rheumat. Dis., 13:* 297-301, 1954.

15324. Howell, T. H.: Relief of rheumatic pains with diethylamine salicylate cream; a clinical trial. *Brit. J. phys. Med., 18:* 62-63, 1955.

15325. Huffman, E. R., G. M. Wilson, C. J. Smyth, and R. Hill: Metabolic effect of phenylbutazone in gouty and non-gouty arthritis. *Ann. rheumat. Dis., 13:* 317-323, 1954.

15326. Isorni, P.: Polyarthrities aiguës et infections des voies respiratories supérieures; la chimiothérapie. *Sem. Hôp. Paris, 31:* 501-505, 1955.

15327. Jaschik, E. O.: Nursing care of the arthritic patient at home. *Amer. J. Nurs., 55:* 429-432, 1955.

15328. Kalliomäki, L.: Role of various surgical operations in the history of patients with rheumatoid arthritis. *Ann rheumat. Dis., 13:* 341-343, 1954.

*Selected references.

15329. Kinsell, L. W.: Suppressive as compared with analgesic hormonal therapy in patients with rheumatoid arthritis. *Ann. rheumat. Dis., 13:* 307-311, 1954.

15330. Kruel, N., and H. L. Winter: Zur Therapie des Rheumatismus mit Togal. *Med. Mschr., 9:* 11-13, 1955.

15331. Lowman, E. W., S. Miller, P. R. Lee, H. Stein, R. King, and L. Heald: Psycho-social factors in rehabilitation of the chronic rheumatoid arthritic. *Ann. rheumat. Dis., 13:* 312-316, 1954.

15332. O'Reilly, T. J.: Treatment of rheumatoid arthritis with organic copper compounds. *Brit. med. J., 1:* 150, 1955.

15333. Piguet, B.: Polyarthrities aiguës et infections des voies respiratories supérieures; le traitement hormonal. *Sem. Hôp. Paris, 31:* 505-517, 1955.

15334. Smyth, C. J., and E. R. Huffman: Gouty arthritis — diagnosis and treatment. *Med. Clin. N. Amer., —:* 543-561, March 1955.

15335. Solomon, W. M., W. J. Zeiter, and P. A. Nelson: Comprehensive physical medicine and rehabilitation for degenerative joint diseases. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 570.

15336. Sommer, D.: L'ergothérapie dans le traitement des rhumatismes. *Sem. Hôp. Paris, 30:* 3792-3795, 1954.

15337. Stepantschitz, G., and E. Kresbach: Rheumabehandlung mit Rosskastanien-Wirkstoffen (Venostasin.) *Z. Rheumaforsch., 13:* 266-275, 1954.

15338. Sunblad, L., N. Egelius, and E. Jonsson: Action of hydrocortisone on the hyaluronic acid of joint fluids in rheumatoid arthritis. *Scand. J. clin. lab. Invest., 6:* 295-302, 1954.

15339. Takino, M.: Fluorescent substances taken from fluorescent bacteria for the care of the rheumatism of the joints and arthralgia. *Ther. Umschau, Bern., 11:* 125-128, 1954.

15340. Toone, E. C., Jr.: Phenylbutazone (butazolidin). *Bull. rheumat. Dis., 5:* 83-84, 1955.

15341. Toone, E. C., Jr., and R. Irby: Effect of cortisone in the long-term treatment of rheumatoid arthritis; observation of thirty-five patients over a three-year period. *Amer. J. Med., 18:* 41-50, 1955.

15342. Van Gelderen, H.: Les injections intraarticulaires d'hydrocortisone dans les affections articulaires. *Acta orthopaed. belg., 20:* 398-409, 1954.

15343. Ward, L. E., and P. S. Hench: Effects of aldosterone (electrocortin), 9-alpha-fluorohydrocortisone acetate, and 1-dehydrocortisone (metacortandracin) in rheumatoid arthritis. *Ann. N. Y. Acad. Sci., 61:* (Art. 2), 620-635, 1955.

15344. West, H. F., and G. R. Newns: Treatment of rheumatoid arthritis by prolonged stimulation of the adrenal cortex. *Lancet, 1:* 578-580, 1955.

XV-E. Skeletal System: *Gout*

15345. Bartels, E. C.: Gout—now amenable to control. *Ann. intern. Med., 42:* 1-10, 1955.

15346. Bishop, C., R. Rand, and J. H. Talbott: Rate of conversion of isotopic glycine to uric acid in the normal and gouty human and how this is affected by vitamin E and folic acid. *Metabolism—clin. & exp., 4:* 174-182, 1955.

15347. Buzard, J., C. Bishop, and J. H. Talbott: The fate of uric acid in the normal and gouty human being. *J. chronic Dis., 2:* 42-49, 1954.

15348. Hoffman, W. S.: Modern advances in the management of gout. *Med. Clin. N. Amer., —:* 307-318, 1955.

15349. Junkersdorf, J.: Zur Pathogenese und Therapie der Gicht unter besonderer Berücksichtigung von Butazolidin. *Medizinische, Stuttgart, 42:* 1355-1358, Oct. 1954.

15350. Kunziker, H.: Beitrag zur Therapie der Gicht mit Butazolidin. *Z. Rheumaforsch., 13:* 296-307, 1954.

15351. Muller, A. F., and W. Bauer: Le problème métabolique de la goutte. *Schweiz. med. Wschr., 84:* 1403-1409, 1954.

15352. Preziosi, P.: Sulla terapia attuale della gotta. *Rif. med., 67:* 417-418, 1953.

15353. Segal, S., and J. B. Wyngaarden: Plasma glutamine and oxypurine content in patients with gout. *Proc. Soc. exp. Biol., N. Y., 88:* 342-345, 1955.

15354. Talbott, J. H.: The metabolic defect of gout. *Med. Clin. N. Amer., —:* 529-542, March 1955.

15355. Zumoff, B.: Failure of folic acid to affect uric acid metabolism in a case of gout. *Metabolism—clin. & exp., 4:* 80-81, 1955.

15356. Anonymous: Control of gout. *J. Amer. med. Ass., 157:* 1127, 1955.

XVI. Skin and Integument

15357. Andrew, W.: *To study the lymphocytes in the normal epidermis of laboratory animals and of human beings at different ages and also under some experimental conditions in which the amount of proliferative activity of the epidermis is changed either in the direction of increased proliferation or in the*

direction of suppression of proliferation. Office Naval Res., Jan. 1953—Dec. 1954, Tech. Rep., #3, pp. 1-5.

15358. Baer, R. L., and L. Schwarzschild: Selected allergic skin diseases in older persons. *Geriatrics, 10:* 265-273, 1955.

15359. Bean, W. B.: The changing incidence of certain vascular lesions of the skin with ageing. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 80-87.

15360. Billingham, R. E., L. Brent, P. B. Medawar, and E. M. Sparrows: Quantitative studies on tissue transplantation immunity. I. The survival times of skin homografts exchanges between members of different inbred strains of mice. *Proc. roy. Soc., (Biol. Sci.), 143:* (910), 43-58, 1954.

15361. Bloom, R. E., S. Woods, and N. Nicolaides: Hair fat composition in early male pattern alopecia. *J. investig. Dermat., 24:* 97-101, 1955.

15362. Flegel, H.: Die Behandlung der Alopezie mit Hypophysen-Frischzellen. *Derm. Wschr., 130:* 1263-1266, 1954.

15363. Lewis, B. L., and H. Montgomery: The senile nail. *J. investig. Dermat., 24:* 11-18, 1955.

15364. Lewis, G. K.: The surgical treatment of wrinkles. *Arch. Otolaryng, Chicago, 60:* 334, 1954.

15365. Malaspina, A., and M. L. Tognacca: Modificazioni istologiche ed istochimiche del derma di topi albkini di differente età; osservazioni citovolumetriche preliminari. *Tumori, 40:* 429-432, 1954.

15366. Von Albertini, A.: Study of maturation of the epidermis epithelium in relation to ageing and cancer formation. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 179-180.

15367. Zorzoli, G.: Ricerche sulla morfologia delle ghiandole cerununose dell'uomo nelle varie età. *Arch. ital. Anat. Embriol., 53:* 117-129, 1948.

See also No. 15175.

XVII. Urogenital System
(includes prostate)

15368. Budniok, R., H. G. Stoll, and G. Altvater: Organspezifische Chemotherapie des Prostata-Karzinoms. *Dtsch. med. Wschr., 80:* (4), 143-146, 1955.

15369. Carroll, G., and R. V. Brennan: Endocrine therapy in carcinoma of the prostate. *J. Amer. med. Ass., 157:* 581-583, 1955.

15370. Cordonnier, J. J.: Total cystectomy and management of carcinoma of the urinary bladder. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 546.

15371. Davis, E., and L. W. Lee: Progress in the perineal prostatectomy; results in 2050 consecutive patients. *J. Urol., 73:* 142-154, 1955.

15372. Deming, C. L., B. M. Harvard, Jr., and J. E. Sokal: Experiences with cortisone in management of far-advanced carcinoma of prostate. *Trans. Amer. Ass. gen-urin. Surg., 46:* 63-75, 1954.

15373. Fergusson, J. D.: Irradiation therapy for prostatic cancer. *Brit. J. Urol., 26:* 347-349, 1954.

15374. Ferulano, O., and A. Mannelli: Il comportamento dell'apparato muscolo-elastico della prostata in condizioni normali e patologische. *G. ital. Chir., 10:* 749-776, 1954.

15375. Fischer, M. I., A. O. Tikkala, and C. A. Mawson: Zinc, carbonic anhydrase, and phosphatase in the prostatic glands of the rat. *Canad. J. Biochem. Physiol., 33:* 181-190, 1955.

15376. Frank, I. N.: A cytologic evaluation of the prostatic smear in carcinoma of the prostate. *J. Urol., 73:* 128-138, 1955.

15377. Gunn, S. A., T. C. Gould, S. S. Ginori, and J. G. Morse: Selective uptake of Zn^{65} by dorsolateral prostate of rat. *Proc. Soc. exp. Biol., N. Y., 88:* 556-558, 1955.

15378. Hennig, O.: Neuere anatomische und physiologische Erkenntnisse über Prostata und Blasennauslass in ihrer Bedeutung für operative Eingriffe. *Z. Urol., 47:* 457-477, 1954.

15379. Herbst, W. P., Jr.: Factors involved in the management of prostatic obstruction. *J. Amer. med. Ass., 157:* 579-580, 1955.

15380. Holst, S. F.: Behandling av prostatahypertrofi. *Tidssk. norske LaegeForen., 74:* 774-778, 1954.

15381. Hudson, P. B., A. L. Finkle, and J. A. Hopkins: Prostate cancer. VI. Mortality rate of radical surgery for adenocarcinoma of the prostate. *J. Urol., 73:* 139-141, 1955.

15382. Lesser, M. A., S. N. Vose, and G. Dixey: Effect of testosterone propionate on the prostate gland of patients over 45. *J. clin. Endocrinol. & Metab., 15:* 297-300, 1955.

15383. Longley, J.: Sarcoma of prostate and bladder. *J. Urol., 73:* 424-429, 1955.

15384. McDonald, H. P., and W. E. Upchurch:

Treatment of prostatic calculi. *J. Amer. med. Ass., 157:* 787-788, 1955.

15385. Morales, P. A., H. Brendler, and R. S. Hotchkiss: The role of the adrenal cortex in prostatic cancer. *J. Urol., 73:* 399-409, 1955.

15386. Rusche, C., and H. L. Jaffe: Treatment of prostatic carcinoma with radioactive colloidal chromic phosphate (P^{32}); a preliminary report. *J. Urol., 72:* 466, 1954.

15387. Scott, W. W.: Results obtained by endocrine control therapy followed by radical perineal prostatectomy in twenty-five selected cases of advanced carcinoma of prostate. *J. Urol., 72:* 504, 1954.

15388. Scott, W. W.: Role of pituitary in normal and abnormal prostatic growth. *Trans. Amer. Ass. gen-urin. Surg., 46:* 33-39, 1954.

15389. Valk, W. L., and R. H. Owens: Endocrine inhibition as related to carcinoma of the prostate. *J. Urol., 72:* 516, 1954.

15390. Weyrauch, H. M., R. P. Beames, and M. L. Rosenberg: Histopathology of prostatic cortex following transurethral prostatectomy. *Surg., Gynec. Obstet., 100:* 175-178, 1955.

15391. Wilson, T. S.: Incontinence of urine in the aged. *Lancet, 2:* 374-377, 1948.

GERIATRICS

I. General Orientation

15392. Bowman, K. M.: Review of psychiatric progress 1954; alcoholism; geriatrics. *Amer. J. Psychiat., 111:* 527-530, 1955.

15393. Knudson, A. B .C.: Geriatrics — potential unlimited. (Editorial). *Geriatrics, 10:* 296-297, 1955.

15394. Stieglitz, E. J.: Constructive medicine in aging; a therapeutic objective. *Geriatrics, 10:* 151-157, 1955.

II. and III. Medical Care and Diagnosis

15395. Abramson, A. S.: Rehabilitation in geriatric practice. *Canad. med. Ass. J., 72:* 327-334, 1955.

15396. Allan, R.: My impression of geriatric nursing. *Canad. Nurse, 51:* 60-61, 1955.

15397. Baker, F.: Physical medicine in treatment of degenerative joint disease. *J. Amer. med. Ass., 157:* 492-493, 1955.

15398. Cameron, G. R.: Some remarks on the pathological basis of ageing. *In: G. E. W.* Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 16-31.

15399. Cooper, A. R.: The health hazards of the senior executive. *Brit. J. indust. Med., 12:* 71-72, 1955.

15400. Copping, G. A.: Some problems of the aged in medical practice. *Canad. Nurse, 51:* 15-16, 1955.

15401. De Lucas, C.: La hidroclimatología en la vejez. *Med. esp., 31:* 37-41, 1954.

15402. Destrem, H.: A propos des thérapeutiques de la sénescence; association vitaminique acide nicotinique-thiamine. *Sem. Hôp. Paris, 31:* 219-222, 1955.

15403. Ferderber, M. B., and G. P. Hammill: An effective comprehensive program for geriatric patients. *J. Amer. med. Ass., 157:* 407-413, 1955.

15404. Fleetwood, J. F.: Fact and fancy in the ageing mind. *J. Irish med. Ass., 36:* 99-105, 1955.

15405. Fraenkel, M.: Hospital care needed by aged people. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 541-544.

15406. Guild, W. R., and R. J. Mansfield: Physical fitness of executives at a U. S. naval shipyard. *Arch. Industr. Hlth., 11:* 121-122, 1955.

15407. Homburger, F.: *The medical care of the aged and chronically ill.* Little, Brown & Co., Boston, 1955, 253 pp.

15408. Kort, K: Special aspects of the nursing care of the aged. *Canad. Nurse, 51:* 22-24, 1955.

15409. Meislin, J.: Psychiatric aspects of physical medicine and rehabilitation; therapist-patient relationship. *Arch. phys. Med., 36:* 25-30, 1955.

15410. Milne, K. J. G.: The importance of the case conference. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 97.

15411. Pemberton, J.: The measurement of health in groups of elderly living at home. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 364-374.

15412. Plenk, H., and F. Stengel: Die ärztliche Betreuung im Altersheim Lainz und ihre Wandlung seit den 50 Jahren des Heimbestandes. *Wien. klin. Wschr., 66:* 906-908, 1954.

15413. Shaw, P. H. S.: The value of a special local authority medical appointment. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 96.

15414. Sherwood, K. K.: Therapeutic technics in geriatric practice. *Northw. Med., Seattle, 54:* 262-264, 1955.

15415. Siegal, W., R. E. Plunkett, and B. Z. Locke: Case findings from routine chest roentgenograms; mass surveys of communities versus general hospital admissions. *J. Amer. med. Ass., 157:* 435-440, 1954.

15416. Sister Mary Francis: The aged in hospital. *Canad. Nurse, 51:* 21-22, 1955.

15417. Walsh, R. C.: Medical care of old people at home. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 80-84.

15418. Wray, R. P.: Chronic disease factor in public assistance. *Publ. Hlth. Rep., Wash., 70:* 91-93, 1955.

IV. Disease
(chronic, infectious, and mental)

15419. Anderson, W. F.: A clinical study of the patients attending a consultative health centre for old people at Rutherglen, Scotland. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 534-540.

15420. Aub, J. C., and H. L. Lombard: Cancer in old age. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 173-179.

15421. Barnes, R. H., E. W. Busse, and A. J. Silverman: The interrelationship between psychic and physical factors in the production of mental illness in the aged. *N. C. med. J., 16:* 25-28, 1955.

15422. Baruk, H.: Some fundamental principles of neuropsychiatry of the elderly. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 420-427.

15423. Bettag, O. L. (Director): *The aged and aging in Illinois. II. The mentally deficient.* Dept. Publ. Welf., Statist. Res. Sect., Illinois, March 1955, Res. Study 68-2, 54 pp. (Mimeogr.)

15424. Brooke, D. F.: Long term illness. *W. V. med. J., 51:* 1-7, 1955.

15425. Collins, S. D., K. S. Trantham, and J. L. Lehmann: Sickness experience in selected areas of the United States; data on illness, by severity, for 100 diagnoses collected by periodic canvasses of households with 100,000 person-years of observation. *Publ. Hlth. Monogr., 25:* 1-96, 1955.

15426. Commission on Chronic Illness: The commission adopts further recommendations on care of the long-term patient. *Chron. Ill. News Lett., 6:* (6), 1-11, 1955.

15427. Conwell, D. V., C. J. Kurth, and P. G. Murphy: Use of psychological tests in determining the prognosis and treatment needs in geriatric mental illnesses. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 450-457.

15428. Ginzberg, R.: Psychiatric and psychological techniques in the treatment and management of elderly psychotics. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 457-463.

15429. Grosse, H.: Age distribution of cancer. *Z. Altersforsch., 8:* 244-254, 1955.

15430. Häfner, H., and S. Wieser: Zur Therapie hirnatrophischer Prozesse Erwachsener mit Glutaminsäure. *Dtsch. med. Wschr., 79:* (42), 1570-1571, 1954.

15431. Harrower, M. R.: *Medical and psychological teamwork in the care of the chronically ill.* Charles C. Thomas, Springfield, Ill., 1955, 244 pp.

15432. Himler, L. E.: Factors influencing prognosis in psychiatric illness of the aged. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 466-472.

15433. Hoff, H., and H. Tschabitscher: Prophylaxis and treatment of psychoses in the aged. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 463-466.

15434. Hoffman, J. L., and L. Konchegul: Clinical and psychological observations on psychiatric patients treated with reserpine; a preliminary report. *Ann. N. Y. Acad. Sci., 61:* (Art. 1), 144-149, 1955.

15435. Hopkins, B.: Comparison between transient and permanent states of altered consciousness in elderly patients. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 437-441.

15436. James, G., and H. E. Hilleboe: Evaluation during the development of a public health program in chronic disease; the Albany Cardiovascular Health Center. *Amer. J. publ. Hlth., 45:* 140-150, 1955.

15437. Kay, D. W., V. Norris, and F. Post: A study of prognostic indicators in the psychoses of the elderly. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 441-444.

15438. Kay, D. W., and M. Roth: Physical illness and post-mortem findings in relation to different psychiatric groups aged 60 and over

admitted to a county mental hospital. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 444-450.

15439. Kramer, M., H. Goldstein, R. H. Israel, and N. A. Johnson: *An historical study of disposition of first admissions to a State mental hospital; the experience of the Warren State Hospital during the period 1916-1950.* Warren State Hosp., Warren, Pa., ii, 51 pp.

15440. Leavell, H. R.: Chronic disease and the behavioral sciences. (Editorial). *J. chronic Dis., 2:* 113-118, 1955.

15441. Letterer, E.: Alter und Krankheit. *Dtsch. med. Wschr., 79:* (40), 1473-1475, 1954.

15442. Linden, M. E.: The significance of dual leadership in gerontologic group psychotherapy; studies in gerontologic human relations. *Int. J. group Psychother., 4:* 262-273, 1954. *Abstr: P. A., 29:* No. 2536, 1955.

15443. Mars, G., and M. Morpurgo: Sul trattamento di alcune sindromi neuropsichiche dell'età senile con clorpromazina. *Gior. Geront., 3:* 226-232, 1955.

15444. Meyer, A., D. Leigh, and C. E. Bagg: A rare presenile dementia associated with cortical blindness (Heidenhain's syndrome). *J. Neurol., Neurosurg. Psychiat., 71:* 129-133, 1954. *Abstr: P. A., 29:* No. 2810, 1955.

15445. Mills, I. J.: Facilities inventory for chronic sickness. *Publ. Hlth. Rep., Wash., 70:* 93, 1955.

15446. Persson, I.: (Chlorpromazine in therapy of arteriosclerotic psychosis and senile dementia) *Nord. Med., Stockholm, 53:* 235-237, 1955.

15447. Rindge, M. E.: Note on the age and sex incidence of poliomyelitis. *J. infect. Dis., 96:* 101-103, 1955.

15448. Roberts, D. W., and D. E. Krueger: One in 8 is a longterm case. *Hospitals, Chicago, 29:* 59-62, 1955.

15449. Rogers, J. B., and R. C. Taylor: The effect of age on the induction of sarcomas by methylcholanthrene in guinea-pigs. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 181-182.

15450. Rusk, H. A., and M. M. Dacso: The dynamic approach to the care of the chronic. *Hospitals, Chicago, 29:* 63-65, 1955.

15451. Sainz, A. A.: The use of reserpine in ambulatory and hospitalized geriatric psychotics. *Ann. N. Y. Acad. Sci., 61:* (Art. 1), 72-77, 1955.

15452. Schinz, H. R., and T. Reich: Die Altersdisposition der Karzinome in der Schweiz 1952. *Dtsch. med. Wschr., 79:* (36), 1369-1372, 1954.

15453. Schinz, H. R., and T. Reich: Die Wandlungen der Karzinomgefährdung in der Schweiz seit der Jahrhundertwende und deren Erklärung durch vorgetäuschte Altersdisposition. *Dtsch. med. Wschr., 79:* (51), 1893-1895, 1954.

15454. Skolnik, A. M.: Estimated prevalence of long-term disability; 1954. *Soc. Sec. Bull., 18:* 20-21, June 1955.

15455. Stern, K.: Reactive depressions in later life. *In:* P. H. Hock and J. Zubin, *Depression*, pp. 144-152. *Abstr: P. A., 29:* No. 2840, 1955.

15456. Stolte, J. B.: (Metastasizing carcinoma as a chronic disease.) *Geneesk. Gids., 32:* (24), 455-457, 1954.

15457. Strong, L. C.: Gerontologic studies of cancer in mice and men. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 182-188.

15458. Tasher, D. C., and M. W. Chermak: The use of reserpine in shock-reversible patients and shock-resistant patients. *Ann. N. Y. Acad. Sci., 61:* (Art. 1), 108-116, 1955.

15459. U. S. 83rd Congress. Second Session. House: *Health inquiry; the toll of our major diseases, their causes, prevention, and control.* U. S. Govt. Print. Off., Wash., 1954, 206 pp. *Abstr: P. A., 29:* No. 1102, 1955.

15460. Zeman, F. D.: Genetic factors in the diseases of later life. *J. chronic Dis., 2:* 11-27, 1955.

15461. Anonymous: Care of chronically ill patients. *J. Amer. med. Ass., 157:* 953-955, 1955.

15462. Anonymous: The long-term and the chronically ill patient. *Med. J. Aust., 42:* 143-144, 1955.

See also Nos. 14882, 15200, 15398, 15478, 15480, 15494, 15498, 15589, 15593, 15651.

V. Pre-mature Aging

(progeria)

15463. Clément, R.: Sénilité précoce et nanisme; progeria de Gilford. *Pr. méd., 63:* 155-157, 1955.

15464. Sarma, A. V. S.: Simmonds' disease and progeria. *Antiseptic, 49:* 870-874, 1952.

VII. Surgery

15465. Campbell, D. C., Jr., and H. T. Langston: Intrathoracic surgical procedures in patients past the age of 60. *J. Amer. geriat. Soc., 3:* 330-336, 1955.

15466. Cavalieri, U.: Le ripercussioni geriatriche degli interventi laparatomici. (Abstract). *Gior. Geront., 3:* 182, 1955.

15467. Cutler, C. W., Jr.: Surgical indications and surgical management in the aged. *N. Y. St. J. Med., 55:* 489-494, 1955.

15468. Fior, R., and C. Calearo: Prognosi chirurgica delle neoplasie cervico-facciali in soggetti anziani. (Abstract). *Gior. Geront., 3:* 182, 1955.

15469. Spangler, H., and H. Wild: Ein Beitrag zur Chirurgie im Alter. *Klin. Med., Wien, 9:* 469-479, 1954.

15470. Thomas, E. G., T. W. Ledwich, and A. J. Hunnicutt: The fluid, electrolyte and nutritional management of the elderly surgical patient. *J. Amer. geriat. Soc., 3:* 311-315, 1955.

See also Nos. 15092, 15245.

PSYCHOLOGICAL PROCESSES

15471. Bartlett, F.: Psychological aspects of ageing. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 209-218.

15472. Batchelor, I. R. C.: The management and prognosis of suicidal attempts in old age. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 472-473.

15473. Birren, J. E.: Age changes in speed of simple responses and perception and their significance for complex behavior. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 235-247.

15474. Bokslag, J. G.: (Effects of age and sex and the influence of the examiner on results of the Lüscher test.) *Ned. Tijdschr. Psychol., 9:* 497-516, 1954.

15475. Burt, C.: The differentiation of intellectual ability. *Brit. J. educ. Psychol., 24:* 76-90, 1954. *Abstr: P. A., 29:* No. 2206, 1955.

15476. Busse, E. W., R. H. Barnes, A. J. Silverman, G. M. Shy, M. Thaler, and L. L. Frost: Studies of the process of aging; factors that influenced the psyche of elderly persons. *Amer. J. Psychiat., 110:* 897-903, 1954. *Abstr: P. A., 29:* No. 2293, 1955.

15477. Colgan, C. M.: Critical flicker frequency, age, and intelligence. *Amer. J. Psychol., 67:* 711-713, 1954.

15478. Conwell, D. V., C. J. Kurth, and P. G. Murphy: Use of psychologic tests in determining prognosis and treatment in geriatric mental illnesses. *J. Amer. geriat. Soc., 3:* 232-238, 1955.

15479. Desai, M. M.: The relationship of the Wechsler-Bellevue verbal scale and the progressive matrices tests. *J. consult. Psychol., 19:* (1), 60, 1955.

15480. Dörken, H., Jr.: Psychometric differences between senile dementia and normal senescent decline. *Canad. J. Psychol., 8:* 187-194, 1954.

15481. Ginzberg, R.: Psychological and somatic aspects. *Amer. J. digest. Dis., 15:* 339-348, 1948.

15482. Howell, R. J.: Changes in Wechsler subtest scores with age. *J. consult. Psychol., 19:* 47-50, 1955.

15483. Husen, T.: La validité des interviews par rapport à l'âge au sexe et à la formation des interviewers. *Travail hum., 17:* 60-67, 1954. *Abstr: P. A., 29:* No. 2326, 1955.

15484. Ikin, A. G.: Psychological problems of maturity. *Pastoral Psychol., 5:* (43), 49-54, 1954. *Abstr: P. A., 29:* No. 2295, 1955.

15485. Jones, H. E.: Age changes in adult mental abilities. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 267-274.

15486. Kay, H.: Some experiments on adult learning. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 259-267.

15487. Keeling, D. C.: Advisory services for old people in the United Kingdom. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 601-603.

15488. Kehrer, F. A.: Über das psychische Altern des Menschen. *Dtsch. med. Wschr., 79:* (42), 1553-1555, 1954.

15489. Kjerland, R. N.: Age and sex differences in performance in motility and strength tests. *Proc. Iowa Acad. Sci., 60:* 519-522, 1953. *Abstr: P. A., 29:* No. 2068, 1955.

15490. Lazarsfeld, S., and A. Kadis: L' "âge critique" est-il un âge critique? *Psyché, 9:* 152-163, 1954. *Abstr: P. A., 29:* No. 3770, 1955.

15491. Lewis, A.: Mental aspects of ageing. *In:* G. E. W. Wolstenholme and M. P. Cameron, (Editors), *Ciba Foundation Colloquia on Ageing. Vol. I. General Aspects,* J. & A. Churchill Ltd., London, 1955, pp. 32-57.

15492. Linden, M. E.: Emotional problems in aging. *Jewish soc. Serv. Quart., 31:* 80-89, 1954.

15493. Loefving, B.: The diagnostic value of some memory tests with selected groups of senile

patients. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 427-430.

15494. Lovett Doust, J. W., R. A. Schneider, G. A. Tolland, M. A. Walsh, and G. B. Barker: Studies on the physiology of awareness. The correlation between intelligence and anoxemia in senile dementia. *J. nerv. ment. Dis., 117:* 383-397, 1953. *Abstr: P. A., 29:* No. 1258, 1955.

15495. Maggi, A., and I. Keklikian: (Psychological and endocrine factors in aging.) *Día méd., 26:* 2093-2098, 1954.

15496. Maleci, O., and G. Pessina: Su alcune elaborazioni del punteggio Wechsler-Bellevue in soggetti normali della provincia di Padova. *Riv. Patol. nerv. ment., 75:* (2), 391-411, 1954.

15497. Mason, E. P.: Some factors in self-judgments. *J. clin. Psychol., 10:* 336-340, 1954. *Abstr: P. A., 29:* No. 3772, 1955.

15498. Nyssen, R.: Introduction à l'étude des relations entre l'involution de l'intelligence et la démence. *Acta neur. psychiat. belg., 54:* 809-830, 1954.

15499. Pacaud, S.: Experimental research on the ageing of psychological functions. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 279-290.

15500. Reitan, R. M.: The distribution according to age of a psychologic measure dependent upon organic brain functions. *J. Geront., 10:* 338-340, 1955.

15501. Scoville, W. B.: Orbital undercutting in the treatment of psychoneuroses, depressions and senile emotional states; psychiatric and physiologic results of fractional lobotomy in the milder emotional illnesses. *Dis. nerv. Syst., 15:* 324-334, 1954.

15502. Singer, S. L., and B. Steffire: Age differences in job values and desires. *J. counsel. Psychol., 1:* 89-91, 1954. *Abstr: P. A., 29:* No. 2617, 1955.

15503. Singleton, W. T.: Age and performance timing on simple skills. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 221-231.

15504. Stoll, W. A.: Value and detriment of senile mental changes. *Schweiz. med. Wschr., 84:* 922, 1954.

15505. Thompson, L. J.: Stresses in middle life from the psychiatrist's viewpoint. *Geriatrics, 10:* 162-164, 1955.

15506. Verzár-McDougall, J.: Learning and memory tests in young and old rats. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 247-259.

15507. Vickery, F. E.: A study of personal counselling needs of senior citizens. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 603-605.

15508. Watson, R. H. J.: The effects of age and experience on the performance of the white rat on a test of emotionality. *Bull. Brit. psychol. Soc., 23:* 6, 1954. *Abstr: P. A., 29:* No. 2091, 1955.

15509. Wechsler, D.: The measurement and evaluation of intelligence of older persons. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 275-279.

15510. Wilson, D. C.: The influence of emotional attitudes on the aging process. *J. Amer. geriat. Soc., 3:* 292-298, 1955.

See also Nos. 14866, 14881, 15455, 15554, 15557, 15609.

SOCIAL & ECONOMIC ASPECTS

I. Accidents

15511. Droller, H.: Falls among elderly people living at home. *Geriatrics, 10:* 239-244, 1955.

15512. Droller, H.: Falls and accidents in a random sample of elderly people living at home. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 374-384.

15513. Metrop. Life Insur. Co.: Fatal accidents among men at the working ages. *Statist. Bull. Metrop. Life Insur. Co., 35:* 5-8, Sept. 1954. *Abstr: P. I., 21:* No. 2076, 1955.

15514. Wain, H., H. E. Samuelson, and F. M. Hemphill: An experience in home injury prevention. *Publ. Hlth. Rep., Wash., 70:* 554-560, 1955.

III. Demography

15515. Alves, E.: A composição por idade da população do Brasil e de suas diferentes partes. *Rev. brasil. Estatist., 25:* 155-164, 1954. *Abstr: P. I., 21:* No. 2209, 1955.

15516. Alves Morgado, N.: Da razão dos sexo e da distribuição etária no censo da população não civilizada da Guiné Portuguesa de 1950. *Centro Estud. Demográf., Revista,* No. 8: 69-93, 1954. *Abstr: P. I., 21:* No. 2210, 1955.

15517. Brazil. Laboratório de Estatistica: Illustração da influência da mortalidade e da natalidade sôbre a composição por idade da

população. *Rev. brasil. Estatíst., 25:* 193-198, 1954. *Abstr: P. I., 21:* No. 2001, 1955.

15518. Canada. Dominion. Bureau of Statistics: *Population estimates by marital status, age and sex for Canada and provinces, 1952 (and including revised estimates by marital status and sex, 1942-1950).* Queen's Printer, Ottawa, 1954, 8 pp. *Abstr: P. I., 21:* No. 2064, 1955.

15519. Chen, C.-S.: Population and settlement in Formosa. *Tijdsch. Econ. soc. Geogr., 45:* 176-180, 1954. *Abstr: P. I., 21:* No. 2016, 1955.

15520. Dominican Republic. Dirección General de Estadística.: *Comentarios sobre algunos de los resultados obtenidos por el tercer censo nacional de población.* Informaciones Estadísticas Dominicanas, March 1954. *Abstr: P. I., 21:* No. 2212, 1955.

15521. Durand, J. D.: Demographic background in developed and under-developed countries. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 32-45.

15522. Germany. Federal Republic. Statistisches Bundesamt.: Die Wohnbevölkerung des Bundesgebietes nach Alter und Geschlecht am 31.12.1953 im Vergleich zu 1949. *Wirtsch. u. Stat., 6:* 472-473, 1954. *Abstr: P. I., 21:* No. 2213, 1955.

15523. Great Britain. Colonial Office: *Report on St. Helena for the years 1952-1953.* H. M. Stationery Office, London, 1954, Colonial Report, 30 pp. *Abstr: P. I., 21:* No. 2034, 1955.

15524. Lemieux, O. A.: Changes in the population pattern as revealed by the 1951 census. *Canad. J. publ. Hlth., 45:* 524-532, 1954.

15525. Portugal. Instituto Nacional de Estatística.: *Análise de alguns indicadores demográficos.* The Institute, Estudos No. 22, Lisboa, 1953, 52 pp. *Abstr: P. I., 21:* No. 2102, 1955.

15526. Spain. Instituto Nacional de Estadística.: *Movimiento natural de la población de España, año 1950.* The Institute, Madrid, 1952, viii, 108 pp. *Abstr: P. I., 21:* No. 2419, 1955.

15527. Switzerland. Eidgenössisches Statistisches Amt.: *Statistisches Jahrbuch der Schweiz, 1953.* Birkhäuser, Basel, 1954, x, 628 pp. *Abstr: P. I., 21:* No. 2422, 1955.

15528. University of Chicago. Chicago Community Inventory: *Demographic and socio-economic characteristics of the population of the city of Chicago and of the suburbs and urban fringe; 1950.* The University, Chicago, 1954, v, 30 pp.

IV. Economic Problems

15529. Epstein, L. A.: Economic resources of persons aged 65 and over. *Soc. Sec. Bull., 18:* 3-19, June 1955.

15530. Morgantini, A. M.: Caratteri demografici e sociali di un gruppo di dipendenti dello Stato. *Rass. Statist. Lavoro, 6:* 231-263, 1954. *Abstr: P. I., 21:* No. 2284, 1955.

15531. Rucker, A. W.: Economic challenge of longevity. *Harv. Bus. Rev., 32:* 94-102, 1954. *Abstr: P. I., 21:* No. 2285, 1955.

15532. U. S. Social Security Administration: Age of the population and per capita income, by state, 1953. *Soc. Sec. Bull., 17:* 20-22, Dec. 1954. *Abstr: P. I., 21:* No. 2286, 1955.

15533. Anonymous: Old-age benefit in current-payment status; December 31, 1954. *Soc. Sec. Bull., 18:* 21-22, June 1955.

IV-B. Economic Problems: *Employment*

15534. Abrams, A. J.: Discrimination against older workers in various countries. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 291-295.

15535. Baker, W. J.: Part-time employment of the aged. *Soc. Sec. Bull., 18:* 4-11; 22, March 1955.

15536. Clark, F.: Later working life in the building industry in Britain. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 303-305.

15537. Daric, J.: Survey of the employment of elderly workers in France. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 295-299.

15538. David, P., and R. Baxt: Employment for pensioners. *Soc. Casework, 36:* 162-165, 1955.

15539. Densford, K. J.: Professional opportunities for the older nurse. *Geriatrics, 10:* 294-295, 1955.

15540. De Vergottini, M.: I problemi dell'occupazione. *Longevità, 4:* (4), 24-32, 1954.

15541. Edwards, H. K.: The aged and retiring pilot. *J. Aviat. Med., 26:* 73-75, Feb. 1955.

15542. Fleming, C.: Age composition of the British iron and steel industry. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 300-302.

15543. Holt, N. F.: Age and employment. *Personnel pract. Bull., 10:* 19-29, 1954. *Abstr: P. A., 29:* No. 3097, 1955.

15544. Johnston, F.: Management and the employment of older workers. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 325-328.

15545. Kirchner, W. K., and M. D. Dunnette: Survey of union policy toward older workers. *J. person. Adm. & Industr. Rel., 1:* 156-158, 1954. *Abstr: P. A., 29:* No. 3769, 1955.

15546. Kirchner, W. K., and M. D. Dunnette: Attitudes toward older workers. *Personnel Psychol., 7:* 257-265, 1954. *Abstr: P. A., 29:* No. 3161, 1955.

15547. Lehman, H. C.: Jobs for those over sixty-five. *J. Geront., 10:* 345-357, 1955.

15548. McFarland, R. A.: Aging is airman's greatest foe. *Aviat. Wkly., 62:* 108, Jan. 17, 1955.

15549. Mathiasen, G.: Practices in American industry. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 312-316.

15550. Moen, B. D.: The ages of dentists; 1954. *J. Amer. dent. Ass., 50:* 330-334, 1955.

15551. Moss, L.: A sample survey of older people and their employment in Great Britain in 1950. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 353-360.

15552. Parukh, S. K.: Old age and employment. *J. voc. educ. Guid., 1:* 35-37, 1954. *Abstr: P. A., 29:* No. 2297, 1955.

15553. Peterson, R. L.: Effectiveness of older workers in a sample of American firms. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 316-320.

15554. Pressey, S. L.: The older psychologist; his potentials and problems. *Amer. Psychol., 10:* 163-165, 1955.

15555. Roberts, A.: British trade union attitudes to the employment of older men and women. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 320-325.

15556. Rosenfeld, L. S., and M. E. Altenderfer: Physicians in public health. *Publ. Hlth. Rep., Wash., 70:* 384-392, 1955.

15557. Scott, W. G.: Counselling and placing older workers. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 330-331.

15558. Shenfield, B. E.: Employment prospects for older workers in Great Britain. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 305-312.

15559. Sister St. Kevin: Employment among older people. *Canad. Nurse, 51:* 26-28, 1955.

15560. Spealman, C. R., and P. T. Bruyere: The changing age distribution of pilots holding first class medical certificates. *J. Geront., 10:* 341-344, 1955.

15561. U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Old-Age and Survivors Insurance. Division of Program Analysis: *Quarterly summary of earnings employment and benefit data.* The Division, Baltimore, Feb. 1955, Vol. 14, 24 pp.

15562. U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Old-Age and Survivors Insurance. Division of Program Analysis: *Workers with insured status on January 1, 1955.* The Division, Baltimore, Feb. 24, 1955, Anal. Note 77, 3 pp.

15563. U. S. Department of Health, Education and Welfare. Social Security Administration. Bureau of Old-Age and Survivors Insurance. Division of Program Analysis. Economic Studies Branch: *Applicants for account numbers; October-December 1954.* The Division, Baltimore, March 31, 1955, 4 pp.

15564. U. S. Department of Labor. Bureau of Employment Security: Services for older workers — the need for developing work opportunities. *Emplym. Sec. Rev., 21:* Nov. 1954.

15565. Welford, A. T.: Problems and methods of further research. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 333-338.

See also No. 15483.

IV-C. Economic Problems: *Retirement and Pensions*

(See also Social Security)

15566. Brower, F. B.: Insurance for retired employees. *Mgmt. Rec., 17:* 104-107, 1955.

15567. Hyman, A. S.: Status emeritus. *Science, 121:* 613, 1955.

15568. Institute of Actuaries: The growth of pensions rights and their impact on the national economy. *J. Inst. Actu., 80:* (Pt. II., 355), 141-288, 1954. *Abstr: P. I., 21:* No. 2283, 1955.

15569. Kennedy, W. D.: Retirement plans. *Ford Times, 42:* 1-64, Sept. 1950.

15570. Marshall, A. D.: Beginning our lifetime vocation. *Amer. econ. Sec., 11:* 22-29, Dec. 1954.

15571. Pingstone, G. W.: Retirement benefit schemes in relation to the employment of older men and women. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 331-333.

15572. Richardson, I. M.: Influence of the home on decisions about retirement. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 328-330.

V. Education

15573. Andrus, R.: The Cold Spring project; the value of a small residential group in the study of change and growth in college graduates over 60. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 616.

15574. Bond, B. W.: Health education for organised groups of older adults; a governmental health agency programme. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 613-615. Also *in: Geriatrics, 10:* 89-91, 1955.

15575. Carlson, A. J.: Can continuous adult education add more life to the later years? *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 610-611.

15576. Donahue, W.: Educational approaches to aging. *Merrill-Palmer Quart., 1:* 57-67, 1955.

15577. Donahue, W.: Action programme in education for later maturity. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 617.

15578. Kaplan, O. J.: Communication of health knowledge to older persons by radio and television. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 611-613.

15579. Reals, W. H.: Programmes for the ageing in American universities. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, p. 615.

VI. Housing and Care

15580. Bartlett, L.: A home for the aged makes use of community resources. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 591-592.

15581. Bologna, S.: From Connecticut to Colonacce. Connecticut center in Italy. *America, 92:*338-339, Dec. 25, 1954.

15582. California. Assembly Interim Committee on Social Welfare: *The nonpsychotic seniles and related problems.* The Committee, Sacramento, 1955, 109 pp.

15583. Evans, G.: Comprehensive care of old people; the role of the local authority welfare department. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 84-95.

15584. Good, J. M.: Residential care of old people in Canada. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 583-584.

15585. Hamrin, G.: Special training for matrons of homes for the aged in Sweden. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 587-589.

15586. Herz, K. G.: Everyday problems in a home for the aged. *Jewish soc. Serv. Quart., 31:* 224-232, 1954.

15587. Hill, M. N.: Homes for old people in England. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 585-587.

15588. Krag, C. L.: Current trends in the institutional care of the aged in the United States. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 580-583.

15589. Levy, M. G.: Syracuse focuses attention on the aged and chronically ill. *Chron. Ill. News Lett., 6:* (5), 1; 4, 1955.

15590. Mackenzie, M.: Housing problems of the aged. *Canad. Nurse, 51:* 25-26, 1955.

15591. Mayall, M. M.: I work in a nursing home. *Amer. J. Nurs., 55:* 67-68, 1955.

15592. National Social Welfare Assembly. National Committee on Aging: *Bridging the gap between existing practices and desirable goals in homes for the aged and nursing homes.* The Committee, N. Y., 1954.

15593. Solon, J., and A. M. Baney: Ownership and size of nursing homes. *Publ. Hlth. Rep., Wash., 70:* 437-444, 1955.

15594. South Dakota. Legislative Research Council. Senile Survey Committee: *Report of the Senile Survey Committee to the Executive Board of the South Dakota Legislative Research Council.* The Committee, Pierre, S. D., Oct. 1954, 27 pp.

15595. Stone, E.: Private nursing homes for the chronically ill in USA. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 589-590.

15596. Taietz, P.: *Administrative practices and personal adjustment in homes for the aged.* Cornell Univ. Agri. Exp. Sta., 1953, Bull. No. 899, 39 pp. *Abstr: P. A., 29:* No. 2299, 1955.

15597. Townsend, G. W. H.: Making the most of institutional accommodation for the elderly. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 76-80.

15598. Weil, J.: The effects of work on the physical and mental health of the older citizens in a home for the aged. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 590-591.

15599. Welfare Council of Metropolitan Los Angeles. Committee on Problems of the Aging: *Housing for the aging; findings and recommendations on protective care facilities in Los Angeles County.* The Council, Los Angeles. 1954, 23 pp.

See also No. 15412.

VIII. Medical Care

15600. Cowan, N. R.: An advisory health clinic for old people. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 96-97.

15601. Gaustad, V.: Scheme for co-ordinated hospital and home services for the aged in Oslo. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 68-69.

15602. Kintner, Q.: The government scheme for medical care of the indigent aged patients in Washington. *Northw. Med., Seattle, 53:* 1262, 1954.

15603. Sheldon, J. H.: The old age aspects of social medicine. *J. R. Inst. publ. Hlth. Hyg., 18:* 9-15, 1955.

15604. Turnbull, F. A.: Medical care for the old-age pension group in B. C. *Northw. Med., Seattle, 53:* 1260, 1954.

See also No. 15612.

IX. Social Problems

(includes social adjustment)

15605. Abrams, M.: Reflections on survey techniques. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 360-364.

15606. Balducci, D.: *I 40 anni.* The Author, Paggio, 1954, xi, 281 pp.

15607. Barron, M. L.: A survey of a cross-section of the urban aged in the United States. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 340-349.

15608. Burgess, E. W.: Human aspects of social policy. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 49-58.

51609. Fitzelle, G. T.: Strength of opinion as an indication of philosophy of life; the relationship between strength of opinion and adjustment. *J. Amer. geriat. Soc., 3:* 306-310, 1955.

15610. Healey, D.: Aged in distress. *New Republic, 131:* 3-4, Dec. 20, 1954.

15611. Karsten, A.: Psychological aspects. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 58-60.

15612. Norway. Old People's Health Committee: *(Our ageing population.)* Norske Gerontologiske Skrifter, Oslo, 1955, No. 1, 54 pp.

15613. Price, A. H.: Problems of the aging population. *Harper Hosp. Bull., 12:* 161-168, 1954.

15614. Sauvy, A.: The historical and sociological basis. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 28-32.

15615. Sebaoun, J.: Les problèmes posés par l'augmentation de la longévité. *Canad. Nurse, 51:* 17-21, 1955.

15616. Sheldon, J. H.: The social philosophy of old age. (presidential address). *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 15-26. Also *in: Lancet, 267:* 151-155, 1954.

15617. Simon, F.: Problèmes économiques et sociaux de la réadaptation. *Sem. Hôp. Paris, 30:* 3773-3776, 1954.

15618. Titmuss, R. M.: Some fundamental assumptions. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 45-49.

15619. Van Zonneveld, R. J.: Medical and social sample survey of the aged in the Netherlands: *In:* 3rd Cong. Int. Assoc. Geront.,

London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 349-353.

15620. Webber, I. L.: Problems of aging and the aged. Chap. 4, *in:* T. L. Smith, (Editor), *Social Problems,* Thomas Y. Crowell Co., N. Y., 1955, pp. 96-123.

See also Nos. 14857, 15670.

X. Social Groups

15621. Alvarez, W. E.: The duration of widowhood. (Editorial). *Geriatrics, 10:* 294, 1955.

15622. Deardorff, N. R.: The religio-cultural background of New York City's population. *Milbank mem. Fd. quart. Bull., 33:* 152-150, 1955.

15623. Ferguson, E. B.: The religious basis for the interdependence of the disciplines concerned with ageing. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 607-608.

15624. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Divorces and annulments; detailed statistics for reporting areas, 1953. *Vit. Statist., Spec. Rep., Nat. Summaries, 42:* (2), 24-42, 1955.

15625. U. S. Department of Health, Education and Welfare. Public Health Service. National Office of Vital Statistics: Marriages; detailed statistics for reporting areas, 1953. *Vit. Statist., Spec. Rep., Nat. Summaries, 42:* (5), 89-116, 1955.

XI. Social Security

15626. Altmeyer, A. J.: *The development of social security in the United States.* Bull. Soc. Sec. Assoc., Geneva, Dec. 1954, pp. 447-462.

15627. Axel, R.: *Trends and relationships in public assistance in the United States, 1940-1952; a statistical analysis.* Govt. Affairs Found., N. Y., 1954, 73 pp. *Abstr: P. I., 21:* No. 2282, 1955.

15628. Belgium. Ministère du Travail et de la Prevoyance Sociale. Office National de Sécurité Sociale: *Neuvième Rapport Annuel—1953.* The Office, Brussels, 1954, 171 pp.

15629. Berlioz, C.: Rhumatisme et sécurité sociale. *Sem. Hôp. Paris, 30:* 3765-3768, 1954.

15630. Brackmann, K.: *Handbuch der Sozialversicherung; eine Systematische Darstellung.* Bad Godesberg, Asgard-Verlag, 4th Ed., 2 vols.

15631. France. Ministère du Travail et de la Sécurité Sociale: *Rapport sur l'Application de la Législation de Sécurité Sociale.* Imprimerie des Journaux Officiels, 1954, 96 pp.

15632. Hewitt, E. S.: The co-ordination of federal social security with public employee retirement plans. *County Off., (Wash.), 20:* 68-72, March 1955.

15633. International Labor Organization. European Regional Conference: *The financing of social security.* Int. Labor Off., Geneva, 1954, 154 pp.

15634. Kimmel, L. H.: Is the federal old-age and survivors insurance trust fund valid? *Nat. Tax J., 7:* 327-341, 1954.

15635. Larson, N.: The service aspects of the OASI program. *Publ. Welfare, 13:* 8-12, 1955.

15636. Myers, R. J.: The purpose of a retirement test in an old-age security system. *Bull. Int. Soc. Sec. Ass., —:* 463-473, Dec. 1954.

15637. Nelson, G. R. (Editor): *Freedom and welfare; social patterns in the northern countries of Europe.* Ejnar Munksgaard, 1953, 539 pp.

15638. Rosati, L. S.: *Guida Nazionale degli Instituti di assistenza e ricovero.* Amministrazione per le attività assistenziali italiane e internazionali, Roma, 1954, 685 pp.

15639. Roth, J.: Old age insurance and welfare in Switzerland. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 62-65.

15640. Scott, W. C., and D. W. Smith: Social security amendments. *Amer. J. Nurs., 55:* 296-299, 1955.

15641. U. S. Congress. House. Committee on Ways and Means. Subcommittee on Social Security: *Social security after 18 years; a staff report.* U. S. Govt. Print. Off., Wash., 1954, 72 pp.

15642. U. S. International Labour Office: *Systems of social security.* The Office, Washington, 1954, 106 pp.

15643. Willcox, A. W.: The contributory principle and the integrity of old-age and survivors insurance. *Industr. & Labor Relations Rev., 8:* 331-346, Apr. 1955.

15644. Winter, K. H.: Gedanken eines Amtsarztes zur Sozialversicherung. *Öff. GesundhDienst., 16:* 251-254, 1954.

15645. Anonymous: Your new social security. *Changing Times, 9:* 7-14, Feb. 1955.

15646. Anonymous: Reappraisal of social security. *J. Amer. med. Ass., 157:* 849-852, 1953.

XII. Social Service and Social Work
(recreation and rehabilitation)

15647. Astbury, B. E.: History of provision for the aged in Britain. *In:* 3rd Cong. Int.

Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 71-74.

15648. Benton, J. G., D. A. Covalt, G. G. Deaver, and H. A. Rusk: Residency training program in physical medicine and rehabilitation. *Arch. phys. Med., 36:* 160-163, 1955.

15649. Blyth Brooke, C. O. S.: Sheltered workshop in a London borough. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 599-601.

15650. Briggs, M. L.: Volunteer recreation workers help the chronically ill. *Nurs. Outlook, 3:* 46-48, 1955.

15651. California (State of). Inter-Departmental Coordinating Committee on Aging. (G. K. Wyman, Chairman): *Report of activities; 1954.* The Committee, Sacramento, Jan. 31, 1955, 13 pp.

15652. Chalfen, L.: Planning leisure-time activities of the aging. *Geriatrics, 10:* 245-247, 1955.

15653. Coste, F., and G. Illouz: Prévention des rechutes des affections rhumatismales par in réadaptation. *Rev. Rhumat., Paris, 21:* 762-768, 1954.

15654. Good, J. M.: Programs for the aged in Canada. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, p. 69.

15655. Greene, L. B., and J. Sokolow: Rehabilitation in the older age group. *Postgrad. Med., 17:* 43-44, 1955.

15656. H. M. Queen Elizabeth. Thé Queen Mother (Patron): *The National Corporation for the Care of Old People.* 7th Ann. Rep., London, 1954, 48 pp.

15657. Houston, R. W.: The responsibility of the community to the aged. *N. Y. St. J. Med., 55:* 486-489, 1955.

15658. Hunt, M. O.: *The range of public welfare services to older people.* Amer. Publ. Welf. Ass., Chicago, 1954, 10 pp.

15659. Iowa State College of Agriculture and Mechanic Arts. Extension Service. Economics and Society: *Senior citizens and their interests; challenging view of a senior citizen.* Iowa State College, Ames, Iowa, April 1, 1955, P. S. 382. 1, 2, 3, 14 pp.

15660. James, B.: The part played by voluntary organisations in welfare work for the aged in England. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 597-599.

15661. Jones A. C.: Problems of rehabilitation in the aged. *Clin. Med., 61:* 617, Aug. 1954.

15662. Kansas. Topeka. State Department of Social Welfare. Division of Public Assistance: *Activities in nursing homes; a handbook for volunteers.* The Division, Topeka, Kansas, 1955, 73 pp.

15663. Kaplan, J.: The significance of group activity on psychogenic manifestations of old people. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 596-597.

15664. Kimmel, D. G.: *Homemaker service for older people.* Amer. Publ. Welf. Assoc., Chicago, April 1955, 15 pp.

15665. Kountz, W. B.: The role of club women in gerontology. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 605-606.

15666. Kuplan, L.: California moves ahead. *Aging*, No. 17, 1-3, May 1955.

15667. Kuplan, L.: The community and the senior citizen in California. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 594-595.

15668. Landau, G.: *Vacation programs for older people; 1950-1952.* William Hodson Community Center, Bronx, N. Y., 15 pp.

15669. Landau, G.: The restoration of group esteem through social group work. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 595-596.

15670. McKain, W. C., Jr.: *Report of the Connecticut Commission on the potentials of the aging.* Conn. Comm. on the Potentials of Aging. Hartford, Conn., Dec. 1954, 125 pp.

15671. Millet, J.: Problèmes de la réadaptation. *Un. méd. Can., 83:* 1126-1131, 1954.

15672. New York City. Welfare and Health Council: *New York City—1955-1965; a report to the community.* The Council, N. Y., 1955, 37 pp.

15673. Pascoe, A.: The role of the caseworker in a neighborhood club for people. *Jewish soc. Serv. Quart., 30:* 430-436, 1954. *Abstr: P. A., 29:* No. 2298, 1955.

15674. Pemberton, A. M.: *Helping older people who have been in mental hospitals.* Amer. Publ. Welf. Ass., Chicago, Sept. 1954, 16 pp.

15675. Porsman, V. A.: Statistical results of rehabilitation in "The Old People's Town" in Copenhagen. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World*, E. & S. Livingstone Ltd., London, 1955, pp. 571-574.

15676. Posner, W.: New developments in case work with the aged. *In: New Horizons*

for Casework with the Aged. Welfare & Health Council of New York City, N. Y., 1955, pp. 1-9. (Mimeogr.)

15677. Rancati, A.: Il servizio sociale e gli inabili. *Longevità, 4:* (4), 13-15, 1954.

15678. Randall, O. A.: A national programme for older people; United States of America. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 65-68.

15679. Rothchild, S.: Sixty-five and over; Golden Age Club, Dorchester, Massachusetts. *Commentary, 18:* 549-556, Dec. 1954.

15680. Rusk, H. A.: Rehabilitation of chronically disabled people. *World med. J., 2:* 8-9, 1955.

15681. Snyder, R. M.: Volunteer program for older persons; senior citizens service corps, New York City. *Recreation, 47:* 582-583, Dec. 1954.

15682. Strong, G. F.: Rehabilitation. *Canad. med. Ass. J., 72:* 247-252, 1955.

15683. Toussaint, J.: La rééducation des rhumatisants aux États-Unis. *Rhumatologie, 5:* 248-251, 1954.

15684. U. S. Department of Health, Education and Welfare. Committee on Aging: *Aging; a community responsibility and opportunity.* U. S. Govt. Print. Off., Wash., 1955, 20 pp.

15685. Wayne, G. J.: Work as therapy with special reference to the elderly. *Ment. Hyg., Albany, 39:* 79-88, 1955.

15686. Weisbach, K.: Rehabilitationsprobleme. *Klin. Med., Wien, 9:* 506-512, 1954.

15687. Williard, H. S.: Occupational therapy for elderly persons. *In:* 3rd Cong. Int. Assoc. Geront., London, 1954, *Old Age in the Modern World,* E. & S. Livingstone Ltd., London, 1955, pp. 606-607.

15688. Zelditch, M.: Re-examination of social organization and agency structure in relation to new developments in case work for the aged. *In: New Horizons for Casework with the Aged.* Welfare and Health Council of New York City, N. Y., 1955, pp. 1-7, (Mimeogr.)

15689. Anonymous: *Adventures in living after 60.* Welf. Fed., Cleveland, Oct. 1954, 18 pp.

See also Nos. 15031, 15395, 15576, 15594.

MISCELLANEOUS

15690. Butigen, W. H.: *Don't grow old.* Vantage Press, N. Y., 1953, 107 pp.

15691. Chisholm, C.: *Retire and enjoy it.* Phoenix House, Ltd., London, 1954, 240 pp.

15692. Colby, E., and J. G. Forrest: *Ways and means to successful retirement.* B. C. Forbes & Sons Publ. Co., Inc., N. Y., 249 pp.

15693. Sauerwein, E.: pH-Veränderungen bei alternden Anästhesielösungen. *Dtsch. zahnärztl. Z., 10:* 63-68, 1955.

See also No. 14867.

IV. MISCELLANEOUS: *Popular Articles*

15694. Davis, M.: How to live to be 100. *Good Housekeeping, 140:* 157-160, April 1955.

15695. Desmond, T. C. Pitfalls of the later years. *Today's Hlth., 32:* 22-23, Nov. 1954.

15696. Desmond, T. C.: Sound approach to old age. *Today's Hlth., 33:* 48-51, Jan. 1955.

15697. Fadiman, C.: Party of one; on being fifty. *Holiday, 17:* 6, Feb. 1955.

15698. French, W. F.: Young ideas keep some oldsters going. *Saturday Evening Post, 227:* 10, March 26, 1955.

15699. Hobby, O. C.: Are you getting your share of social security? *Amer. Mag., 159:* 21, April 1955.

15700. Princi, A. R., and J. P. Mitchell: Life doesn't end at forty-five. *Cath. World, 180:* 246-251, Jan. 1955.

15701. Raskin, E.: How old is old? Excerpt from many worlds; seen and unseen. *Sci. Digest, 37:* 9-12, Jan. 1955.

15702. Safford, H. B.: Tell me, doctor; dropping of the pelvic organs. *Ladies Home J., 72:* 39, Feb. 1955.

15703. Spicer, B. C.: How young America lives at seventy-five! *Ladies Home J., 72:* 107-110, Jan. 1955.

15704. Stare, F. J.: Overeating shortens life; interview. *U. S. News, 38:* 50-54, Jan. 7, 1955.

15705. Stare, F. J., and J. A. Shea: How to live longer and like it. *McCalls, 82:* 82, Jan. 1955.

15706. Swanson, G.: Should a woman tell the truth about her age? *Reader's Dig., 66:* 91-92, Jan. 1955.

15707. Valentry, D.: Staying young's their business. *Amer. Mercury, 80:* 47-50, April 1955.

15708. Anonymous: Aged need amino acid enriched bread or cereal. *Sci. News Lett., Wash., 66:* 373, Dec. 11, 1954.

15709. Anonymous: Chances of living to 100. *Sci. News Lett., Wash., 66:* 383, Dec. 11, 1954.

15710. Anonymous: Livelier at seventy-five and up. *Newsweek, 44:* 55, Dec. 13, 1954.

15711. Anonymous: Find enzyme that controls aging. *Sci. News Lett., Wash., 67:* 9, Jan. 1, 1955.

15712. Anonymous: Too old at forty-five? *America, 92:* 369, Jan. 8, 1955.

15713. Anonymous: How to retire and stay active. *Nations' Bus., 43:* 94, Jan. 1955.

15714. Anonymous: Life begins at sixty. *America, 92:* 634-635, March 19, 1955.

15715. Anonymous: After 45 it is hard to get a job. *U. S. News, 38:* 88-91, April 1, 1955.

15716. Anonymous: How to ease into retirement; age center of New England. *Business Wk., —:* 66-69, April 2, 1955.

15717. Anonymous: Facts about your weight. *Reader's Dig., 66:* 23-25, April 1955.

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First Annual Medical Symposium

CLINICAL ASPECTS OF THE AGING PROCESS

with special reference to

Neurology, Psychiatry, Nutrition, and Cardiology
Philadelphia, October 23, 1955

The Home for the Jewish Aged, 5301 Old York Road, Philadelphia 41, Pennsylvania, will sponsor the First Annual Medical Symposium on Clinical Aspects of the Aging Process, with special reference to Neurology, Psychiatry, Nutrition, and Cardiology.

The Symposium will be held at the Home on Sunday, October 23, from 10:00 a. m. to 4:00 p. m. Dr. Nathan Blumberg will be Chairman.

The participants on the three panels will be as follows:

Neurology and Psychiatry: Dr. Matthew Moore (Chairman); Dr. Maurice E. Linden, Dr. Abraham Rabiner

Nutrition: Dr. Robert S. Goodhart (Chairman), Dr. Donald M. Watkin, Dr. Hertha Sorter

Cardiology: Dr. James B. Donaldson (Chairman), Dr. Raymond Harris, Dr. Simon Dack

All interested physicians are cordially invited to attend.

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